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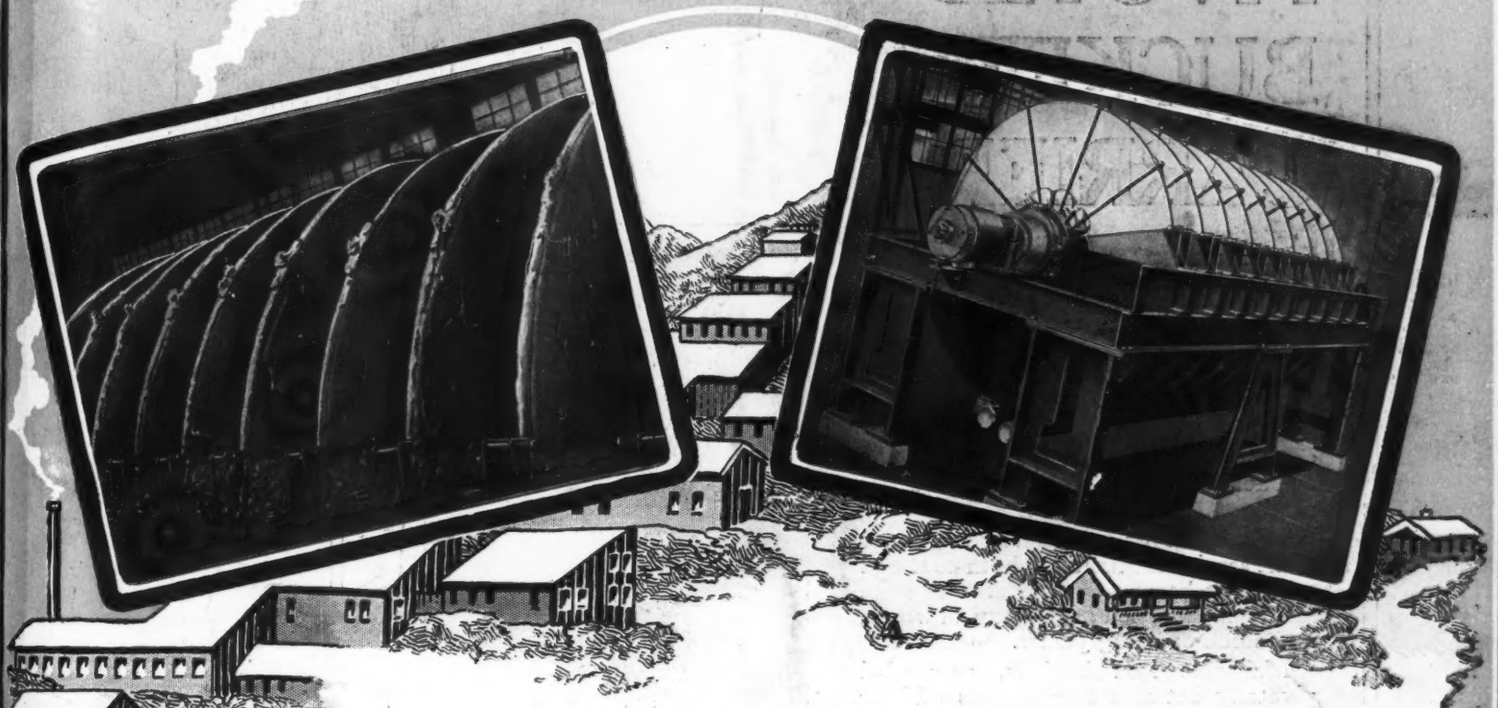
McGraw-Hill Co., Inc. Price 20c. New York, March 8, 1919



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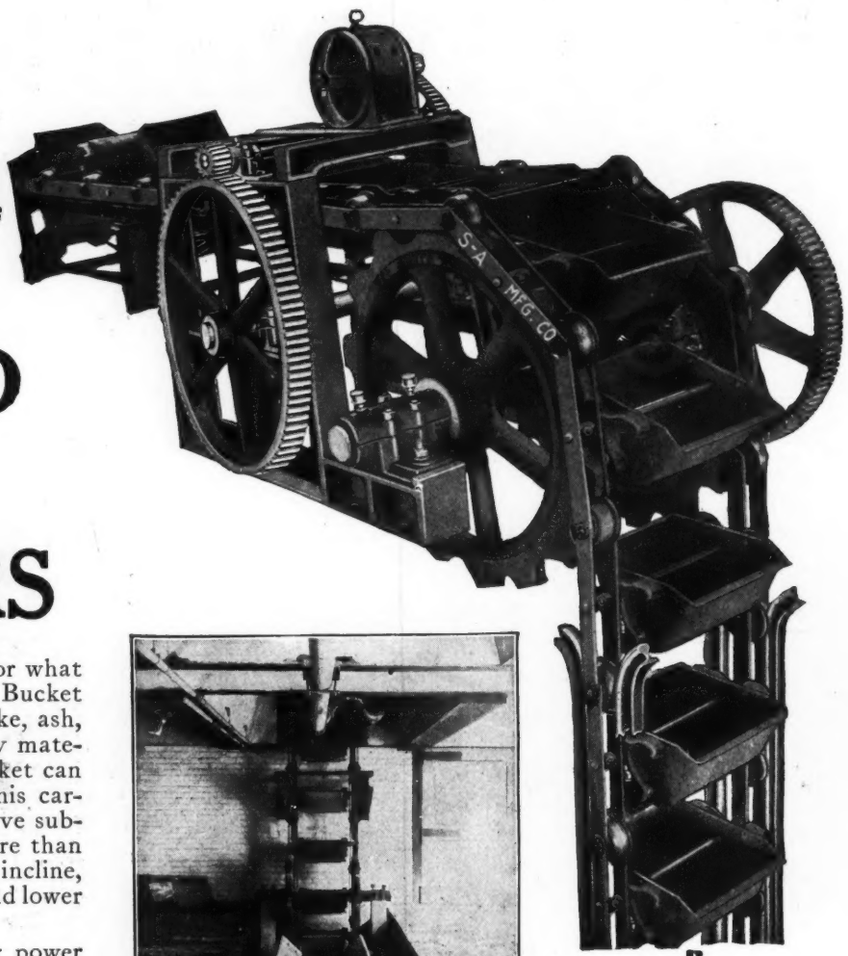

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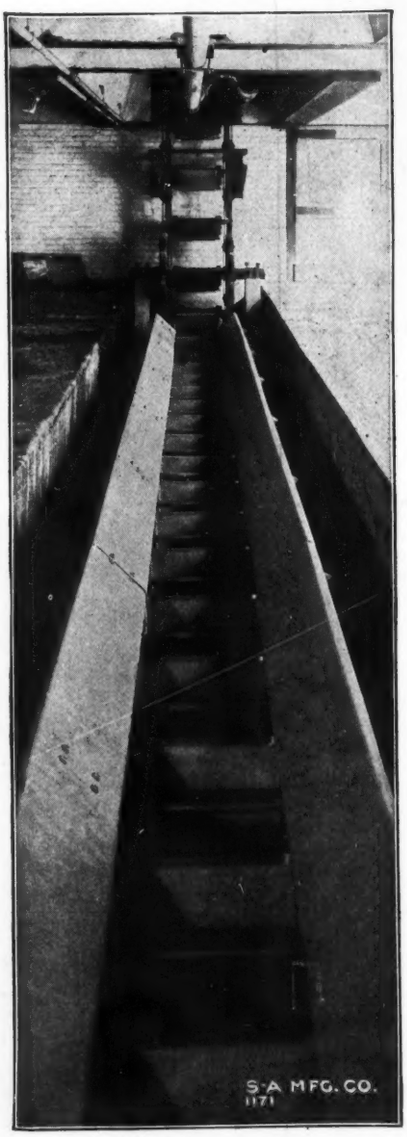

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Engineering and Mining Journal

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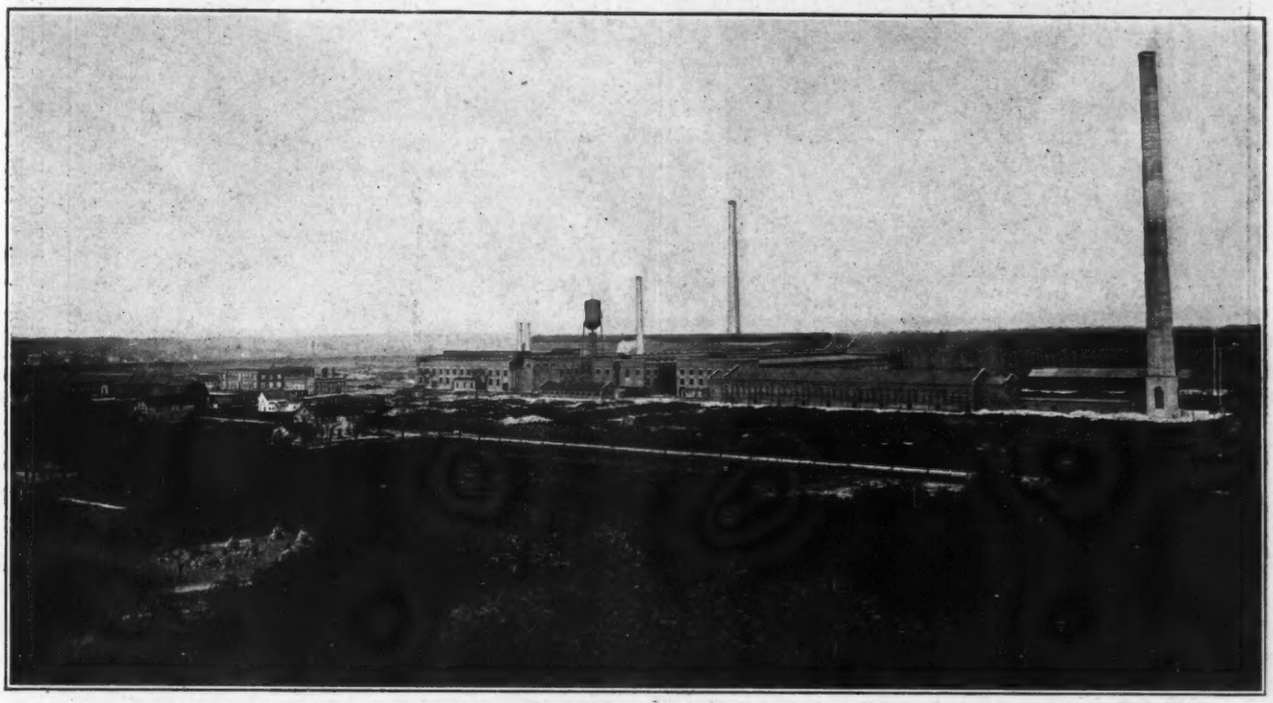
Volume 107 *Number* 10



PANORAMIC VIEW OF THE INTERNATIONAL NICKEL COMPANY'S NEW PLANT, LOOKING NORTHEAST

International Nickel Company's Refining Works At Port Colborne, Ontario

By W. L. WOTHERSPOON*

An account of the preliminaries incidental to the erection and of the details relating to the installation of an important plant to supply, among other products, a refined metal—nickel—of which Canada possesses almost a monopoly. The principal features are the permanent character of the buildings, and the solidity and completeness of the various units. Successful operation has already proved the soundness of the design and an annual output of 15,000,000 lb. of nickel is expected.

THE increased demand for nickel products caused the International Nickel Co. to decide, late in 1916, to proceed with the construction of a refining plant in Canada, of sufficient capacity to meet the nickel requirements of the British Empire. An extensive examination of numerous sites was conducted, and it was decided to erect the refining works at Port Colborne, Ontario. Port Colborne is situated on the shore of Lake Erie and is about 20 miles due west from Buffalo. The Welland Canal, connecting Lake Erie with Lake Ontario, passes through the town.

The works site consists of 330 acres and has a frontage on Lake Erie of about a mile. This frontage immediately adjoins that of the Canadian Furnace Co., and is somewhat to the eastward of the entrance to the canal. In addition to the acreage mentioned, the company acquired extensive water rights on the lake front and convenient to the canal basin, where there is a deep-water frontage, to meet the requirements of lake transportation. Railroad facilities are provided by the Grand Trunk Ry., a branch line of which passes the north boundary of the refinery site.

The site is almost level, and about 8 ft. above the lake, except along the shore, where sand dunes about 300 ft. wide and 30 ft. high have been formed by wind. The ground consists of 1 to 2½ ft. of peat, on top of from 1 to 10 ft. of blue clay, which lies directly on a limestone bedrock, which provides excellent foundations.

There are, in all, 31 buildings of steel-and-brick con-

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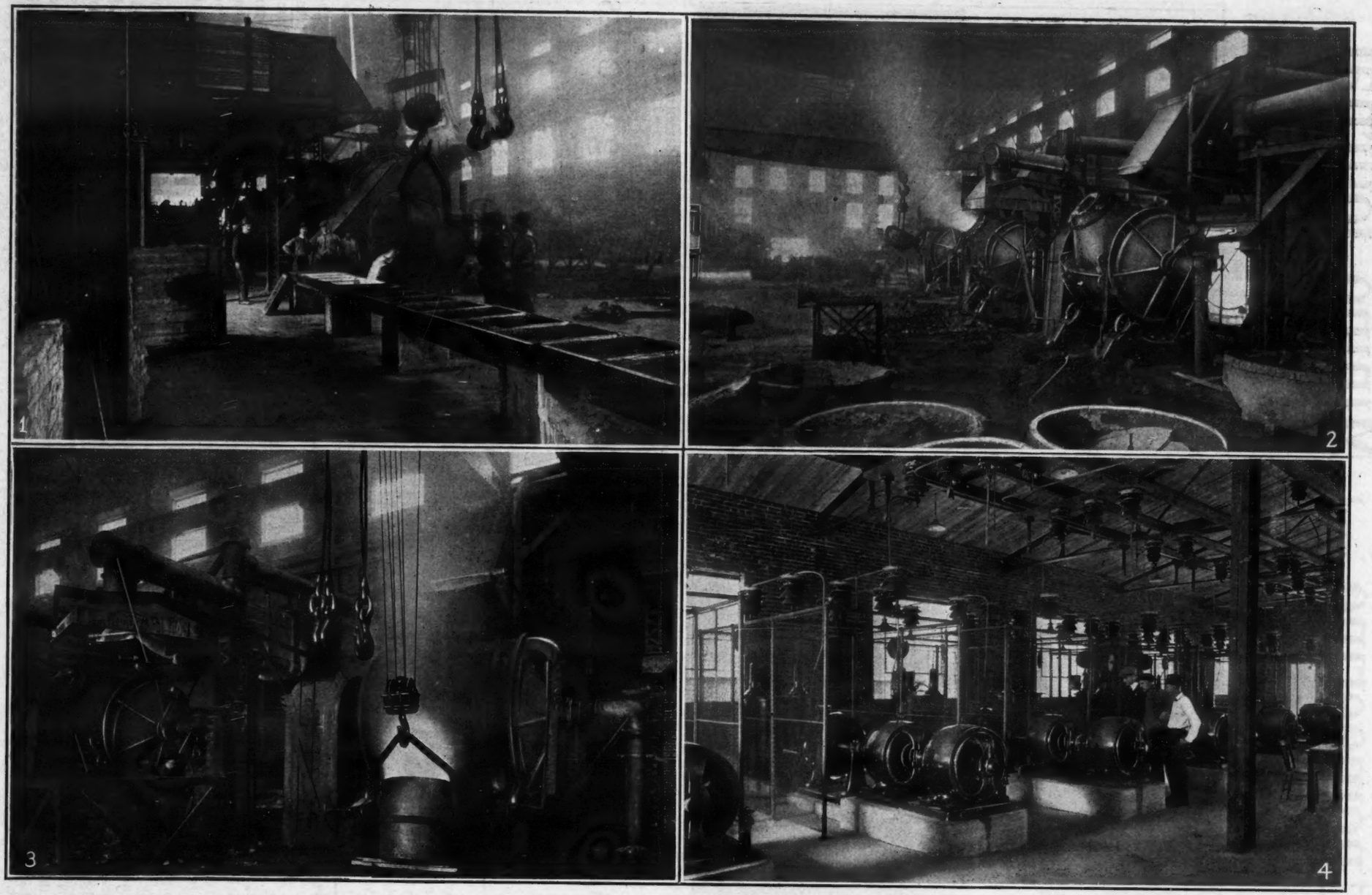
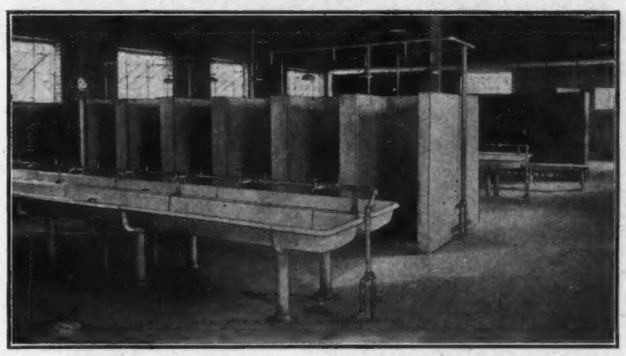


FIG. 1. VIEW OF MAIN BUILDING, SHOWING CASTING OF COPPER. FIG. 2. COPPER CONVERTERS OPERATED FROM PULPIT ON EXTREME LEFT. FIG. 3. COPPER CONVERTER WITH IMPROVED DRAUGHT HOODS AND EFFICIENT MOTOR HOUSING. FIG. 4. SUB-STATION FOR COTTRELL INSTALLATION

struction, plans for which were begun in October, 1916. The land was so near the high-water elevation of the lake that the area to be occupied by the buildings and streets was raised about 3 ft., sand being obtained from the dunes by steam shovels and spread over the site, this work following the clearing of trees and brush and the removal of peat. Foundations of all buildings and equipment were carried down to bedrock, and were built, to a great extent, in winter under severe climatic conditions, when the temperature was frequently 10° or more below zero.

The plant was designed with a view to securing maximum efficiency, by the introduction of mechanical and metallurgical apparatus, and was arranged to reduce the labor required for operation to a minimum. All equipment is of permanent character, so that charges for maintenance will be as small as possible. The buildings are of steel frame and brick walls. The roofs are of special wood construction, and are covered with Johns-Manville salamander roofing.



INTERIOR OF CHANGE HOUSE

The design of the works provided for a complete power plant, a water-supply system, a separate sewerage scheme for storm water and sundry drainage, an electric-conduit distribution system for power and lighting, as well as piping systems for steam, oil, and compressed air. All piping and cables are carried underground, so that there are no obstructions between the buildings.

The various units of the plant are served by both standard-gage and narrow-gage railroad tracks for facilitating the unloading and handling of materials.

The water supply is obtained through a 4-ft. square concrete conduit, over 3000 ft. long, extending from the Welland Canal to the center of the plant, under the power house. This conduit was built in a trench blasted out of the solid rock, so that a gravity supply of water, up to 50,000,000 gal. per day, can be obtained. This system made it possible to place all pumps in connection with the water supply in the basement of the power house, giving important advantages of control.

The area of the works site between buildings has been graded so as to provide adequate means for the disposal of storm water. A series of sewers, connecting with large trench ditches excavated through the property, has been arranged, the water finally discharging through a concrete culvert which passes through the sand dunes into Lake Erie. The sanitary pipe service flow is at such a low level that an ejector-chamber pumping station is provided, from which sewage is discharged to a disposal plant situated in the sand dunes. This plant is constructed on the activated sludge process, which provides for the aëration and clarification of sewage, resulting in an effluent free from objectionable matter. This sewage plant is the only one of its kind in the district, and was installed on the recommendation of the Provincial Board of Health of Ontario.

A number of illustrations are given in this issue which show the disposition of the main-process buildings, power house, warehouse, administration buildings, and laboratory. Several change houses have been provided, supplied with modern lockers, shower baths, and other improvements. A hospital, in a detached building, has an examination room for the reception of patients, for the administration of first aid, and a completely equipped operating room with sterilizers and other modern appliances. Particular attention was paid to this department, the nearest hospital being at Welland, six miles away.

The question of comfort and health of the employees has been given every consideration. A staff house is provided for the employees and a clubhouse for the accommodation of the unmarried men and executive heads. The clubhouse contains both residential and recreation facilities, and both buildings are situated at the entrance to the works, amid the pleasant surroundings of well laid-out lawns, flower beds and shrubs. The chief officials have houses of attractive design which were built by the company, to the west of the canal in the main residential district of Port Colborne.

Details of the Metallurgical Plant

The largest process building is 746 ft. long and 125 ft. wide, divided into two bays, and containing the major portion of the heavy machinery and metallurgical equipment, among which are three cupolas, three reverberatory furnaces, two slag furnaces, and three converters. Here the matte received from the smeltery at Copper Cliff undergoes initial treatment. The method of handling the raw materials is of interest. Matte, coke, and fluxes are brought in on an elevated trestle of reinforced concrete. This trestle connects with bins of similar construction at the back of the process building, and is of sufficient strength to take standard railroad equipment. The materials are dumped from the cars into the various bins, from which they are drawn at the main floor, where arrangements are made for making up and weighing the furnace charges.

The matte, which consists of 55% nickel and 24% copper, is smelted with salt cake, the nickel separated and the copper bessemerized in 84 x 126-in. Allis-Chalmers converters. Electric tilting gear is used, and the converters are controlled from a pulpit conveniently situated across the aisle. One 50-ton, one 35-ton, two 20-ton, and two 5-ton cranes are installed in this building, all of which were manufactured by the Dominion Bridge Co., of Montreal.

Among other machinery of special interest are three electrically driven direct-connected turbo blowers of 7500-cu.ft. capacity and 20-oz. pressure. These are used for cupola service and were furnished by the Rateau-Battu-Smoot Co., of New York, and are situated in an annex to the main building where good light, accessibility and cleanliness are easily obtained.

Flues for the various furnaces are arranged to insure minimum heat losses and obstruction in the building,

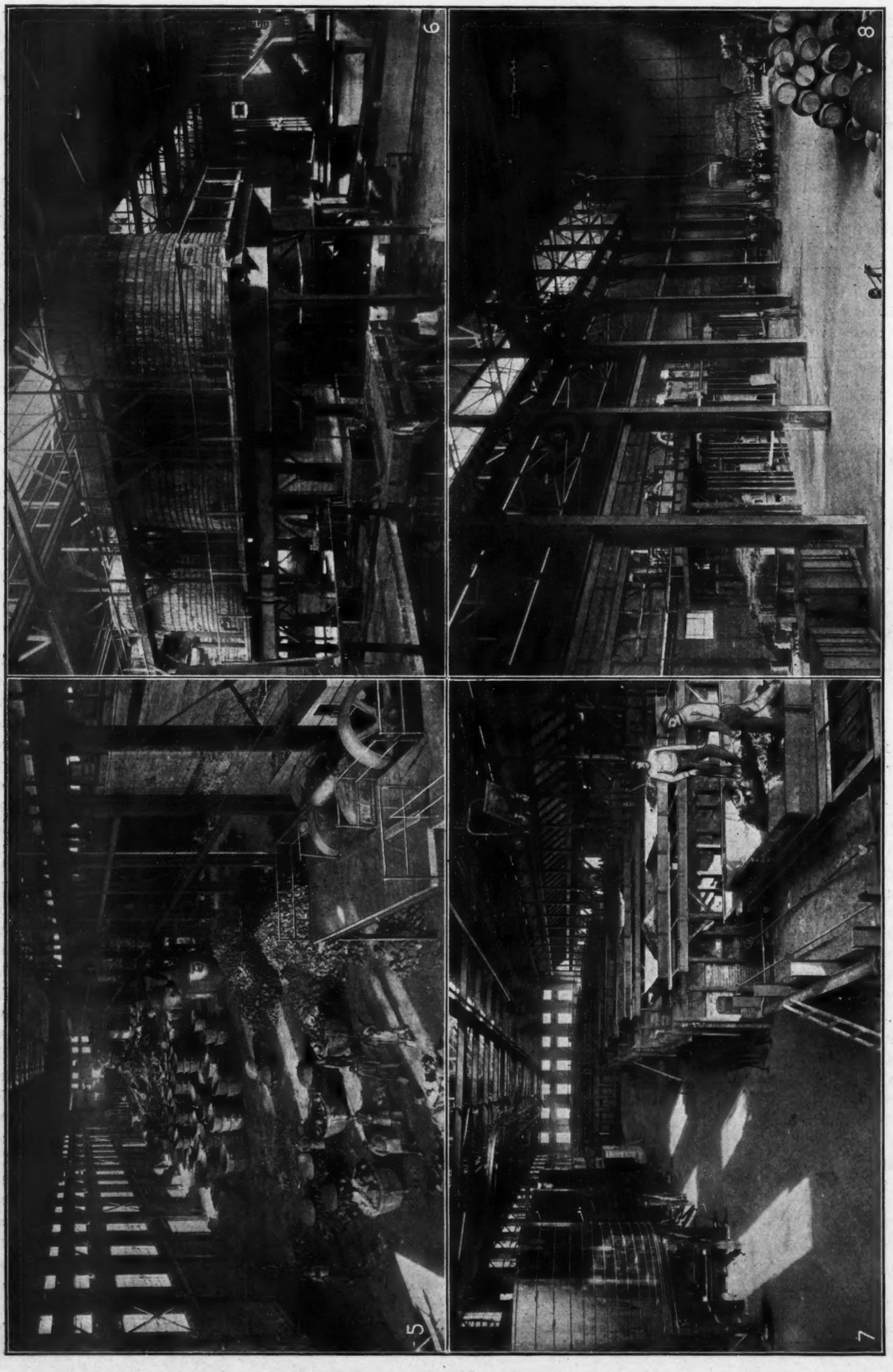


FIG. 5. CUPOLA BUILDING LOOKING NORTH. FIG. 6. INTERIOR OF LEACHING BUILDING. FIG. 7. INTERIOR OF CALCINING BUILDING.
FIG. 8. INTERIOR OF REFINERY BUILDING

and are jointly connected to a concrete chimney 350 ft. high and 12 ft. at its smallest diameter. One of the most modern Cottrell electrostatic precipitation plants for the treatment of flue gases is provided, consisting of seven treaters, conveniently placed in relation to the main flue so that any portion or all the gases can be subjected to the process or discharged directly to the base of the chimney.

Among other process buildings are those devoted to leaching and roasting, the former part of the process being carried out in a structure 420 ft. long by 90 ft. wide. The roof trusses span the entire width of this building, so that the whole area is free from columns.

Ball mills are used for reducing the nickel sulphide previous to its being chemically treated in concrete tanks, which occupy the major portion of the area of this department. These reinforced-concrete tanks are elevated about 3 ft. from the floor, and, on account of the nature of the product handled in them, were cast at one pouring. The supports, post girders, and sides of the tanks are made in one monolith, without construction joints, for the length of 150 feet.

Mechanical Handling of Material Perfected

Special attention was paid to lighting and ventilation in this department, and the handling of materials is carried out mechanically by means of an overhead telpher system arranged to reach all parts of the building, together with electrically driven distributing machines for charging the tanks. To facilitate the handling of the product between the leaching and roasting departments, these are connected by three overhead bridges, the overhead telpher system being arranged for service in both departments. Weighing sections are provided at these overhead bridges to facilitate the quick and accurate determination of the quantities of the products handled.

The building in which the roasting furnaces are installed is 380 ft. long, 110 ft. wide, and has one clear span of 90 ft. in which the 10 mechanical and hand-calcining furnaces were installed. Extending the entire length of the building a space of 20 ft. is used for a reinforced-concrete overhead coal bunker. The coal is received on standard railroad cars and dumped in a hopper below the track outside of the building, from which it is fed, by a reciprocating gate feeder, to a coal crusher. After being reduced in size, it is hoisted with a bucket elevator and discharged to a belt conveyor extending the entire length of the coal bunker. A traveling tripper is provided to unload the belt at any desired point.

Details of Flues and Dust Chambers

The flues from the roasting furnaces are carried below the floor level and connected with a large dust chamber of the wire-hung type. This dust chamber is 300 ft. long by 60 ft. wide and is divided, lengthwise, by a center wall, to form two large flues, each of which is nearly 30 ft. wide and 24 ft. high. The bottoms of the flues are of concrete, and the top is of brick arch construction sprung between steel crossbeams. Cross-walls, 8 ft. high, are provided every 32 ft. of the length of the dust chamber, thus making a series of pockets.

The entire area of the dust chamber is hung with wires placed on 4½-in. centers, 500 miles of wire being used for this purpose. The wires are suspended on special frames, which are, in turn, connected with an operating device outside the chamber, conveniently arranged so that the dust caught can be periodically precipitated. The dust collects in the pockets previously described, access to which is provided by steel doors which permit the use of small cars for handling the product. The flue gases, after passing through the dust chamber, are discharged into the base of a concrete chimney of the same size and construction as that already described in connection with the main-process building. It may be added that these concrete chimneys were built by the General Concrete Construction Co., and, although heavily reinforced, are designed as gravity chimneys for a wind velocity of 100 miles per hour. They are lined throughout with fire brick and have terra-cotta caps; the design of the base called for extra heavy construction, owing to the large number and area of the flue entrances.

Nickel Refinery Is Most Complete Plant

The nickel-refinery department received particular study in connection with the working out of the details of equipment and the arrangement of the installation. One part of the building is used for the storage of chemicals and other products, and contains an elaborate system of bins, and measuring and weighing devices, for the preparation of furnace charges to go to the nickel-refining furnaces, which are in the main portion of the building. These furnaces are of special design, owing to the high temperatures which exist under the operating conditions desirable. They are equipped with oil burners, and a special grade of fuel oil is used.

Power-Plant Feature

The power plant shows evidence of careful planning, and the design indicates that future conditions have been anticipated. The equipment at present installed provides for ample plant extension, and space has been reserved for future enlargement of the boiler house and turbine room. The building is of the usual brick, steel, and reinforced-concrete power-house design.

The main power-house boiler room contains four Babcock & Wilcox standard water-tube boilers, each of 4319 sq.ft. heating surface, set in two batteries. These boilers are built for a working pressure of 160 lb. per sq.in., each being fitted with B. & W. superheater, which raises the temperature of the steam about 100°. B. & W. chain-grate stokers are also a feature of the equipment.

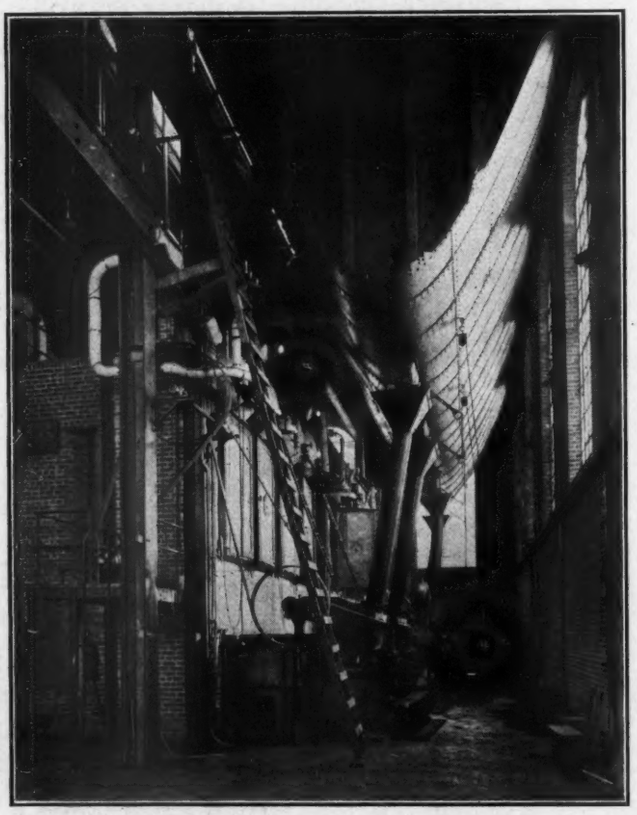
Two B. & W. boilers of special design are installed for utilizing the waste heat from the reverberatory furnaces in the nickel refinery. These boilers are built for an output of about 400 boiler-horsepower each, and are of particular interest, as their design represents the latest development in this phase of engineering, resulting from extensive investigations by the Babcock & Wilcox Company.

Coal is received from the cars in a track hopper, crushed in a Jeffrey crushing roll, elevated, and conveyed overhead to a suspended bunker, from which it is fed as required to the stokers. The ashes are removed from the ash pits by ash cars running in an underground tunnel to the elevator and ash-storage bin, from which they are dumped into cars for removal. One

6 x 175-ft. reinforced-concrete chimney conveys the products of combustion from the boilers in the power house. The waste-heat boilers are served by two 5 x 100-ft. reinforced-concrete chimneys.

Turbines and Generators

Two Ridgway-Rateau high-pressure turbines furnish power for the direct-connected d.-c. generators, each of 1000-kw. capacity. These turbines operate under 150-lb. initial steam pressure and 28-in. vacuum and run at 1700 r.p.m. The power house also contains two other turbo-driven high-pressure blowers, which supply air for the converters. Like the turbo-generators, these units are of Ridgway-Rateau make. The turbo-blowers are each of 15,000-cu.ft. capacity, and deliver air at 15-lb. pressure. They are connected to high-pressure condensing turbines operating at 8500 r.p.m. and were designed by the Rateau-Battu-Smoot Co., of New York.



A VIEW OF THE BOILER ROOM

The superseding of the reciprocating engine by the turbine in large power plants has facilitated the elimination of the cumbersome blowing engine. The high rotating velocities obtainable today are especially suitable for the operation of contrifugal blowers, and the turbo-blowers at this plant are much more economical of space than blowing engines of similar capacity would be. The impellers are built up around a large-diameter shaft with dovetail radial slots milled in it. The impeller blades are of nickel steel and tapered in section, being much thinner at the tip than at the root, and are driven into these slots. Distance pieces are inserted between the blades in several stages. All turbines are equipped with Frahm tachometers, supplied by James Biddle, of Philadelphia.

Two No. 7 Westinghouse LeBlanc jet condensers, with individual air and circulating-water pumps, serve the turbo-generators. Each unit is fitted with a 31-hp. steam turbine, and a reduction gear for the pump drive. These condensers are each capable of handling 17,500 lb. of condensate per hour, and maintain a 29-in. vacuum with 40° cooling water. For the turbo-blowers, two similar No. 5 units are installed. They are fitted with 21-hp. steam turbines, and are capable of handling 11,000 lb. of condensate per hour at 29.05-in. vacuum with 40° cooling water.

The main switchboard supplies the plant with direct current at 250 volts. Lighting and other 110-volt services are supplied by means of a three-wire service, operated by two 20-kw. motor-generator balancing sets. I. T. E. circuit breakers, Weston indicating ammeters, and Sangamo wattmeters are installed on the generator and feeder panels.

Feed-Water Equipment

The feed water is heated by exhaust steam from the various plant auxiliaries in Webster-Lea units. The heaters were supplied by Warren Webster & Co., of Camden, N. J., and the Lea meters by the Yarnell-Waring Co., of Philadelphia. Two units were installed, one for 5000 hp., equipped with Lea recorders and having a capacity of 275,000 lb. per hour, and the other similar in construction to the first, having a capacity of 1500 hp., or 100,000 lb. per hour. Both are of extra heavy construction, and were designed to withstand a back pressure of 10 lb. per square inch.

A two-inch Venturi meter measures all feed water, and the feed pumps are of Lea-Courteny make, direct-connected to Terry steam turbines of standard type. Owing to the provision for the horizontal parting of the casing when necessary, the interiors are easily accessible for repair; and, as no oil comes in contact with the steam, an oil separator is unnecessary.

Auxiliary Equipment

In a plant of this size facilities for repairing machinery are not only advisable but necessary, and ample provision has been made. The machine shop is of good size, and has space to contain a large amount of equipment. Although the installation is not fully complete, and all of the machinery is not yet installed in permanent position, a good idea of equipment may be gained from a description of the various units.

A 12 and 28-in. McKabe double-spindle lathe, with a 24-ft. bed, is provided for the heavy turning, and a Willard engine lathe serves for the finer and smaller repair jobs. A Hamilton drill and a Niles-Bement-Pond radial drill are also provided. A Bertram double punch and shear, a Kelley shaper, and Racine hack saws form part of the equipment. The machine-shop building is about 175 ft. wide and 200 ft. long, with two side bays and a center aisle for a crane runway, and it also serves to house the forging equipment and a complete electrical repair shop. All repairing is done here. Armatures and field coils are rewound, and a complete stock of repair parts is kept on hand.

A separate building houses a carpenter shop, which also serves as a cooperage in which all the barrels required for shipment purposes are assembled.

In a plant of this magnitude it is wise to make adequate provision for the workmen's health. The sani-

tary features indicate that a considerable amount of care and thoughtfulness has been given to the question.

All water used in the plant is chlorinated, not only the drinking water, but that used in plant operations as well. The water supply is obtained through a 4-ft. square intake from the Welland Canal, and is passed through the pumps and chlorinated, and then goes to an elevated tank, where time is given for its complete purification. Mention has previously been made of the sewerage system.

For workmen engaged in laborious occupations, provision must be made for the changing of wet and dirty clothing and the donning of comfortable and warm apparel for street wear. Four change houses have been built, with a total of 600 lockers and with hot and cold showers and lavatory accommodations.

Details of Operations

The Port Colborne refinery began operations last June, and when at full capacity will be capable of a yearly production of about 15,000,000 lb. of nickel and 8,000,000 lb. of copper.

The engineers responsible for the installation have given special attention in the design and construction of the plant and to the possibilities of expansion, and have arranged the equipment in such a way that additions to machinery and equipment can be made in an efficient manner.

The plant was built at a cost of over $5,000,000. The result impresses the visitor and makes him feel that not only is Canada—and Ontario in particular—to be congratulated on the introduction of nickel refining upon a permanent basis, but that credit is also due to the Foundation Co., of Montreal and New York, as the main contractor responsible for the construction, and to The International Nickel Co. for the broad and liberal attitude shown in having this plant built under the stress of war conditions.

Hoisting-Rope Accidents*

Ten mine accidents, which resulted in 12 deaths, were reported in 1917 as occurring on the Rand by the government mining engineer as being due to the breaking of hoisting ropes, chains, or couplings. In eight cases it was the rope that broke, in one instance it was the coupling, and in the other it was a badly made short splice that pulled out. The coupling and two of the ropes broke owing to a jam in the haulage; in other ropes it was due to damage resulting from bad coiling, defective leads, or being run over. In the other two cases of rope fracture the supervision was at fault, and the ropes should not have been continued in service. Of 29 instances of ropes (or couplings) breaking during the year, 24 occurred in the use of hoisting ropes, and six of these resulted in casualties. Twelve were caused by overwind or runaway, and fifteen were due to derailment, jam or collision, in shaft or tip. In one case where the connection was broken, owing to an overwind, the safety catches successfully held the cage. One rope broke on account of its jumping its sheave, and the remaining one because it was worn out, mainly through internal corrosion. The following circular was issued to managers of mines:

"It has been found that wire ropes of compound construction subjected to corrosive agencies, as is particularly the case when these ropes are employed for baling acid water, are likely to deceive engineers as to the strength remaining in them. This is especially the case if the absolute thoroughness of the examination is at all departed from. Where reduction of diameter, or circumference, of the rope has taken place incommensurate with the external evidence of wear, the part of the rope under examination should first be fully loaded and, secondly, relieved of all load. Any noticeable difference in circumferences under these circumstances and the slackening of the outside wires when the load is off will indicate that internal corrosion is present. The extent of corrosion inside the strand can only be estimated by the slackness of the outside wires. The corrosion between the strands can be further examined by untwisting the rope or displacing the strands sufficiently with a marlin spike. Engineers are apt to imagine that reduction in size of a rope may be due to some relatively unimportant collapse of the hemp core. In a test at the Mines Department mechanical laboratory of a 1.28-in. diameter rope, the hemp core was entirely removed for about six feet of the length. The specimen was gradually loaded up to 30 tons, but, beyond a slight increase of the lay from 10½ in. to 11 in., subsiding after the test to 10¾ in., there was practically no alteration in the shape or size of the rope. No observer unacquainted with the circumstances would have imagined that the core had been removed or even disturbed. In recent tests of corroded ropes the following results were obtained:

RESULTS OF TESTS OF CORRODED ROPES

Original Diameter	Original Breaking Load (Pounds)	Diameter at Test (Inches)	Breaking Load at Test (Pounds)
1.5 in. (wires 0.099 in.).....	222,208	1.41	191,960
1.5 in. (wires 0.099 in.).....	222,208	1.40	166,660
1.5 in. (wires 0.099 in.).....	222,208	1.30	137,260
1.5 in. (wires 0.099 in.).....	222,208	1.23	66,880
1.5 in. (wires 0.102 in.).....	220,000	1.22	97,260
1.25 in. (wires 0.115 in.).....	148,700	1.23	137,660
1.25 in. (wires 0.115 in.).....	148,700	1.00	78,920

"In all the above-mentioned cases the outside wires were less than half worn, but the internal corrosion was excessive, most marked inside the strands. The wires were also brittle. Experience has shown that the remarks concerning corrosion on the certificate of biannual tests are taken as merely applying to the test specimen and are not considered as having a bearing on the state of the rest of the rope. This information, however, should not be neglected, and the condition of the rope adjacent to the place where the test piece was cut off should be ascertained. It is not usual for corrosion to occur only at one spot in a winding rope."

*Abstract of an article "Rand Mine Accidents Due to Ropes Breaking," in Oct. 19 issue of *South African Mining Journal and Engineering Record.*

The Peiyang Iron Works has been organized for the purpose of working iron mines in the Province of Chihli, China. According to the Far Eastern Bureau, the company is capitalized at $4,000,000, of which the Chinese government will supply one-fourth, the civil governor of the province one-fourth, and merchants the remainder. The iron works will be established at Hsuanhuahsien. It is understood, also, that plans are under way in the Province of Anhui for the establishment of an iron foundry, to be called the Hua Chang Iron Foundry, for which $1,000,000 has already been raised. The office of the company will be at Penpu.

The Compound Air Lift

By A. W. ALLEN

The efficiency of a simple appliance that can be constructed easily is sometimes the first point to be questioned, and this is often due to the fact that such a mechanism will usually work if badly designed, when it naturally fails to satisfy in the matter of economical result for power expended. The air lift is an example, and it is a well-known fact that the ease with which it may be constructed too often leads to the adoption of a type of design which ignores all the principles involved, and excess power is used as a corrective. In this paper a compound air lift is described, constructed from piping and fittings which will again be available for ordinary use when a pump is installed or the water is allowed to rise. Such an installation possesses many obvious disadvantages, but other instances may occur where it may be considered as affording the only way out of a difficulty—where nothing else but a few lengths of pipe and an assortment of fittings are available, and where power supply is limited to a comparatively low pressure of air.

THE compound air lift is suitable where objections may be raised against the construction of a sump of sufficient depth to satisfy the efficiency requirements of an ordinary single lift. It is also applicable when the available pressure of air is low. The depth of the various stages can be adjusted in this particular, but it must be remembered that a very low available pressure is likely to cause unnecessary complications in the arrangement by introducing too many units. This necessitates a proportionally large number of pipe fittings, and increases friction. Under such conditions the system is not recommended, although exceptional cases may call for exceptional methods of treatment.

The Fundamentals of a Compound Air Lift

A compound air lift is merely two or more simple air lifts arranged in series—the rising main of the first discharging into the sump of the second, and so on. A loss of fall at each stage is inevitable, and this also involves a small loss of power. The system can be arranged to duplicate or triplicate any of the ordinary designs in use; and the customary self-regulating features can be incorporated in each of the various units.

I once had occasion to utilize the compound air-lift principle under somewhat unusual circumstances. An old mine working had to be dewatered to drain an adjoining shaft. The ground was loose on all sides, the timbers were in a rotten and collapsing condition, and ancient-filled stopes would "run," and discharge débris at the least provocation. The old working had to be drained as far as possible by a system that made personal attention near the water level unnecessary.

A small compressor furnished air at a low pressure; and, even if a pump could have been made to do the work, there would continually have been the danger of interment of both the pump and anyone who happened to be attending to it. A compound air lift was therefore constructed which permitted the gradual lowering of the water to a level in proportion to the depth of successive submergences, and so personal risk was eliminated. Soundings disclosed the fact that timbers had collapsed to such an extent that only a narrow channel remained in one place. This was found sufficient, however, to permit the passage of the lift pipes.

A somewhat diagrammatic drawing of a compound lift of this class is shown in the illustration, but in actual construction it is, of course, possible to bunch the various pipes together, and so insure greater compactness than is indicated. Strainers attached to the foot of the lowest lift, and at other necessary points, are advisable, and should preferably be made of ample dimensions to obviate any throttling of the intake.

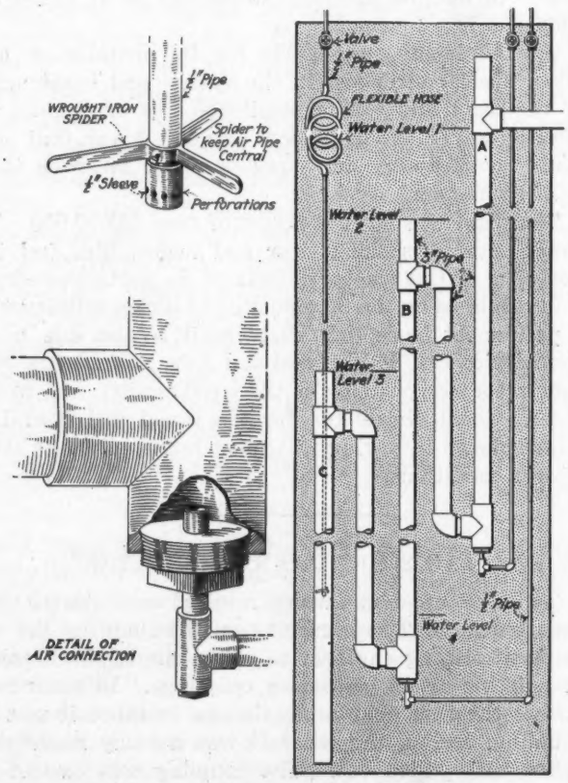


DIAGRAM OF COMPOUND AIR LIFT

The need for the constant shifting and readjustment of the pump, as the water lowers, can be avoided by constructing the apparatus complete and by placing it at the lowest point in the first instance; and then by pumping the water in stages. The various pipes can be assembled, and the added sections bolted or screwed together as the pump is lowered. Permanent air connections are indicated, but can be omitted when it is considered preferable, and flexible connections used instead. The permanent connections were available, in the instance under description, only when the

pressure had been reduced by the help of the flexibly connected air pipe.

It will be noticed that the permanent air connections are attached through a plug at the lower arm of a T-piece in each case. This design was purposely adopted to minimize friction, as it was found that the extension of the air pipe into the rising main served no useful purpose and, furthermore, constricted the suction of the pump. By arranging the supply as shown it was found that there was no tendency for the air to escape other than where it was needed, except when an unnecessary volume was being used.

There is one disadvantage in the use of the flexible air connections and a loose pipe system, apart from the fact that the introduction of another pipe in the rising main increases the frictional resistance, and that is due to the fact that the air pipe may rest against the side of the lift pipe. This will result in a partial distribution of the air through the liquid. The objection may be of little account in the case of small lifts, but should be avoided in large ones. The ill-effects may be reduced by bolting a "spider," of three arms, to the outside of the air pipe, near the bottom, which will maintain it in a central position (see cut). The arms must be of such a length that the "spider" forms a *very* loose fit in the inside of the rising main. It is preferably made of wrought iron, and kept from slipping off at the bottom of the pipe by means of a sleeve which may be bored around its lower end, in the manner shown, in order to distribute the air more effectively.

Operation of Compound Lift With Flexible Air Connections

By reference to the diagram it will be noticed that four water levels are given. It may be assumed that level No. 1 shows the original position of the water. The flexible air connection is then put into the rising main *A* to a depth consistent with available pressure, and gradually lowered therein as the water is reduced in the shaft until level No. 2 is reached. The flexibly connected pipe is then withdrawn from rising main *A* and transferred to *B*. As soon as the second lift is in operation, water will be delivered so that lift *A* can be operated by means of the permanently connected air pipe. As soon as water level No. 3 has been reached, the flexible connection is withdrawn from air lift *B* and transferred to *C*. As soon as this is in operation, the permanent connection to supply air for lift *B* can be used. The final water level will be approximately as shown at No. 4, with the air pipe at the bottom of the lowest lift pipe.

Ratio of submergence to lift will vary in such installations according to local conditions. Economy in small lifts may demand a ratio of from 1½ or 2 to 1 of submergence as compared with lift. In other instances economical work is of secondary consideration, especially where air pressure is low, and a shallow submergence may be adopted.

The arrangement shown permits the easy escape of the air when lifting is accomplished. Spasmodic or jerky delivery of water usually indicates faulty conditions as to air volume or submergence ratio, which should be regulated as far as practicable to insure a more or less even stream from the discharge pipe.

U. S. Employment Service

Engineers, executives, men of college training and practical experience in business and technical fields are now being released from the Army, Navy and from other war work. The professional and special section of the U. S. Employment Service, a branch of the Department of Labor, has been organized for the benefit of employers in need of these men. The service is entirely free of charge.

The New York Office, headquarters for the eastern zone, at 16 East 42nd St., covers the following states: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Ohio, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, and Alabama. The Chicago office, headquarters for the central zone, at 63 East Adams St., covers all remaining states. Later, zone offices will be established to take charge of part of the territory now in the Chicago zone.

The United Engineering Societies, composed of the four great engineering organizations—the American Society of Mechanical Engineers, the American Society of Civil Engineers, the American Institute of Electrical Engineers and the American Institute of Mining and Metallurgical Engineers—are now coöperating with the professional and special section in placing men in the engineering professions. In the event that the New York City Employment Bureau at the national offices of the above-mentioned societies cannot supply a man meeting an employer's requirements, the requisition is at once referred to the professional and special section, where thousands of graduates of engineering colleges and men of practical experience are available.

Support Asked for Potash Bill

As part of a campaign to secure the passage of the Potash Imports License Bill (Senate No. 5557), the American Mining Congress has issued a circular under date of Feb. 15 in which the present situation is outlined. After describing existing conditions in the industry and pointing out the shrinkage in the 1918 cotton crop as illustrating the need for potash, the circular states:

> We estimate the present American production to be at the rate of one-third present American requirements, and that next year it will be one-half. Should the Potash Imports License Bill (Senate No. 5557) become a law, we believe the price trend would be as follows:
>
> Crop season 1919-20—One-third United States potash at $3 per unit K_2O, $3; two-thirds imported potash at $1.25 per unit K_2O, $2.50; total for three units, $5.50; average per unit, $1.83.
>
> Crop season 1920-21—One-half United States potash at $2 per unit K_2O, $2; one-half imported potash at $1 per unit K_2O, $1; total for two units, $3; average per unit, $1.50.
>
> After 1921, United States potash will be available at $1 per unit K_2O.

Important Iron-Ore Districts have been discovered between Malili and Lake Toewoeti, in the island of Celebes, in the Dutch East Indies, according to *Iron and Coal Trades Review*. Iron ore had previously been found only in four fields in the islands, of which one, near La Rona, on Lake Toewoeti, had been explored seriously. The ore in the newly discovered area is roughly estimated to contain 50% Fe, and it has been calculated that the field contains fully 10,000,000 tons of ore. Samples sent to Batavia from East Celebes were tested and found to contain on an average more than 50% Fe, and almost 0.06% phosphorus.

The Mineral Industry in Venezuela

BY CHARLES F. Z. CARACRISTI*

A paper containing statistics of interest and value in regard to the production of minerals in Venezuela in recent times. The principal minerals dealt with are gold, copper, petroleum, asphaltum, magnesite and coal; and the production of other materials of secondary importance may result from greater publicity and sounder methods of metallurgy and industrial procedure.

THE following statistics have been compiled from official data and from information gathered from independent sources. Those for 1918 are approximately correct.

VENEZUELAN MINERAL PRODUCTION 1917 AND 1918

	1917	1918
Gold	$634,170	$471,900
Copper	1,966,760	855,440
Petroleum	145,984	211,200
Asphaltum	1,081,340	564,000
Magnesite	18,000	6,000
Coal	266,686	268,000
Totals	$4,072,940	$2,376,540

Aside from the coal, petroleum, and asphalt contracts, there are, in actual operation, 179 mining properties, 53 of which are subject to assessment work before titles can be granted, and 97 are merely filings of record that must be approved by Congress before they are placed in the probation class, i.e. before assessment work can legally begin. Recently, I have received good samples of cinnabar, and I understand that 11 entries have been made in various parts of the country. The government tax is so heavy on mining the metal, however, that its commercial exploitation is not possible. No doubt the law could be changed if the value of the deposits warranted.

Alabaster is found in the State of Yaracuy, the quality being equal to the Italian product. The colors are white, pink, red, and yellow. It remains to be seen if the quarries, which extend over a considerable area, are capable of yielding large blocks free of blemishes, and whether the product will stand transportation.

Potash has been reported as existing at various points along the coast, but samples submitted were found to consist of ordinary salt and about 3% of potash. Extensive areas of low-grade phosphate rock cover the Coro Peninsula, but the material has no commercial value. Its analyses are about the same as those of the marls that cap the Eocene beds of the coastal plains of Alabama. Diamonds are found in the placer beds of the Callio country. The iron deposits of the Rio Orinoco should be of interest, as there is a large area of iron-bearing territory; but, although much has been written on the subject, no serious study of the deposits has yet been made. It would not pay to embark on a mining venture such as this, where a large capital must be invested to insure favorable returns, unless the operating company had an absolute monopoly of the region by actually owning the land as well as the mines.

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Mining in Venezuela is restricted to a few foreign corporations, and development is retarded by lack of confidence on the part of investors. It is not a mining country. The territory contains only small areas that are capable of producing minerals in commercial quantities and at a reasonable profit. The important items that offer future possibilities, and that, today, form the bases of actual production, are iron, magnesite, asphaltum, petroleum, and copper. I have failed to mention the gold output, because the future is somewhat problematic, on account of uncertainty as to the life of the deposits, the scarcity of labor, the terrible climate in the gold-producing regions, and the high cost of materials and supplies needed by those in charge. In the future, thanks to scientific sanitation, the greatest drawback may disappear.

Also, I failed to classify Venezuelan coal as a valuable mineral asset, because its quality does not stimulate a spirit of optimism, in view of the competition with crude oil in the local markets. Moreover, the coal is of no value for export. It is a lignite with from 5 to 13% sulphur and from 12 to 19% ash, low in fixed carbon and high in moisture and iron. The iron ores of Imataca (Orinoco River region) and the magnesite of the Island of Margarita may give promise for the future if the deposits fall into responsible American hands, and provided that contracts can be drawn that do not lend themselves to blackmailing lawsuits, as has been the experience in the past. In this connection the President of the republic recently spoke sternly to the Venezuelan judges; but I fear that something more than mere words will be necessary to destroy the prevailing habit on the part of irresponsible "tin-horn" lawyers and state judges from conspiring together to levy bribes and blackmail from foreigners. Strangers have no right to dictate to the country that grants them hospitality and an opportunity to acquire wealth, but it would seem that, if the trouble and controversies between foreigners and natives were subjected exclusively to the jurisdiction of the federal courts, as they are in certain cases in the United States, or left to a consular court, great benefits would result and many international issues would be avoided.

REGRETTABLE CONDITIONS PREVENT DEVELOPMENT

The trouble does not come from the federal government, but from the greed, perversity, and ambitions of individuals operating in conjunction with court functionaries and politicians. This condition is highly regrettable, because it prevents the immediate development of many mining enterprises and other foreign ventures in Venezuela as in other Spanish-American countries. There can be no extensive developments until investors are protected by the federal government, and until laws are passed with that end in view. Of course, I am speaking in the interest of small enterprises, and not extensive monopolistic ventures that have the capital, influence, and other moral and physical requirements to insure the support of the governments and to force respect and protection.

In 1917 gold was produced in Venezuela as follows:

STATISTICS OF GOLD PRODUCTION IN VENEZUELA FOR 1917

	Grams	Value
The Eldorado Gold Mining Co	77,871	$46,722.60
El Marne	71,300	42,780.00
La Salvacion	88,350	53,010.00
El Diamente	72,972	43,783.20
Gold Fields of Venezuela	249,461	149,676.60
Carabobo	28,505	17,103.00
Belgica	93,000	55,800.00
El Remo	17,332	10,399.20
Dos de Octubre	13,590	8,154.00
Marruecos	6,943	4,165.80
Alto Cuyuni	46,112	27,667.20
Cara al Sol	56,750	34,950.00
Lo Increible	82,736	49,641.60
Riqueza	53,382	32,029.20
Placer gold extracted by Indians and Venezuelans that is of free exploitation (amount shipped abroad)	98,647	59,188.20
Totals	1,056,951	$634,170.60

The production for the year 1918, from the data I have in hand, is approximately 786,500 gm., valued at $471,900, produced by the Gold Fields of Venezuela, Ltd., the Eldorado Gold Mining Co., the Increible, the free placer zone, and a few other producers. The war conditions greatly disturbed the industry, and four producers suspended operations in the Callao district.

Venezuela Bonanzas Do Not Always Materialize

Lo Increible is a local concern that sold shares at a fabulous price on the most glowing reports and by means of the most attractive samples that were ever seen in this country. Widows and orphans forfeited their all to get into the "bonanza." The property is in the hands of foreign interests; and, honestly and scientifically operated, is a fair proposition and should pay dividends for some time to come. The most important gold-mining company is without doubt the Gold Fields of Venezuela, Ltd. The Eldorado Mining Co. also has good properties.

Lo Increible company has installed a cyanide plant to work over its slimes, but I believe this was entirely unnecessary, as the sulphides readily decompose in this climate; and, after two years or less, the tailings can be worked over, oxidation having taken place in the meantime. Of course, if the quartz is to be treated at once, there may be some reason for the plant; otherwise it has been capital invested without any real necessity, as 80% of the gold is free.[1]

The New Callao Mining Co., Ltd., of London, has not operated its properties since 1916, except for the performance of some prospect work during the first three months of 1917. The Gold Fields of Venezuela, Ltd., of London, is a consolidation of various English corporations.

Commercially profitable quartz has been encountered in the Lagunas and the San Antonio mines. Large quantities of low-grade ore have been found elsewhere, but it cannot be beneficiated under existing conditions. The company has already blocked out 140,000 tons that will assay, on an average, 12 gm. of gold per ton. The quartz veins run east and west, with a southerly dip. At the mine La Unda the vein runs north and south, with a westerly dip. The company has completed the installation of a new cyanide plant, and is using a continuous counter-current decantation process. The plant has a capacity of 50 tons per 24 hours and has cost the company $14,000.

[1]The comment made by our contributor is likely to lead to a mistaken impression as to the advisability of adopting cyanidation. Although the pyrite may oxidize rapidly, this does not necessarily mean that cyanidation is not preferable to any further attempt to recover the gold from the slimes by simple methods. —Editor.

El Amparo Mine, Ltd., of London, went into voluntary liquidation in 1918. It was the owner of the La Paz concessions.

Copper Output Shows a Decrease

The copper exports for the years 1917 and 1918 follow:

VENEZUELAN COPPER MINING IN 1917 AND 1918

	1917, Tons	1918, Tons
South American Copper Syndicate, Ltd., London	48,542	21,386
La Cumaragua Company (local company)	580	.....
Sindicato Buria (local syndicate)	36	.....
Sindicato Aleman, Caracas	11	.....
Totals	49,169	21,386

A discrepancy will be found between my figures and those of the Ministry of Fomento. This is due to the fact that, in the first place, I am using tons of 2000 lb., whereas the government uses metric tons. In the second place, I add the figures for shipments that do not appear in the government statistics, and am basing the statistics for 1918 on steamship invoices, as no government reports are available.

The Aroa mines of the South American Copper Syndicate of London, situated in the State of Yaracuy, are of considerable value, and production has been retarded only because of the difficulty of obtaining ships for the transportation of the ore. This company has a good plant and a small smeltery for the reduction of ore to matte. The district should have a good future, if the reduction of copper can be carried on successfully in an electric furnace, as plenty of water power is available for the purpose. This company owns its own railway and wharves at the port of Tucacas; but, although the harbor is safe against storms, it lacks depth, ships are forced to anchor nearly a mile from the shore, and loading has to be done with barges.

La Cumaragua company is a local concern which has spent plenty of money without tangible result. The copper-bearing vein has not been found, and carbonates are being extracted from the blocked zone. The ore occurs in pockets, and resulted from the leaching of the surrounding territory and the precipitation of the copper in pockets of iron as a replacement. The company has a good plant, and I have no doubt that proper prospecting, under professional advice, would discover the ore veins. The property lies in the possible ore belt and on a quartz vein that at other points contains copper. To the east, the same veins that carry copper to the west substitute it for iron pyrites. The change is very gradual, the iron increasing and the copper decreasing, until the copper disappears.

Pretensions of Land-Owners Complicate Operations

The Syndicate Aleman, of Caracas, owns the copper-zinc prospects known as the Santa Ysabel, south of the town of Villa de Cura, in the State of Aragua. The work done is not sufficient to justify an opinion, although good ore is in sight. Much money has been spent by the syndicate and its predecessors in work of questionable value. The books of the two companies show that $32,000 has been expended in prospecting, but the work actually executed could easily be duplicated for less. What happened in this case is just what happens elsewhere. The two syndicates thought that they would serve the ends of sure economy by employing an inexperienced friend to manage their property. This friend, as is usual, knew nothing about

mining, so much was wasted. The prospecting was done in an oreshoot where two veins bisect each other; and, as the ore was abundant, all the prospecting was done around this vein, without making any effort to find anything in the extension of the veins themselves. I shipped 11 tons of this ore to the United States; it assayed 4.61% copper and 10.22% zinc, and this may be considered the average for the oreshoot. Indications of the existence of similar ore extend over an extensive area, but the difficulty rests in the fact that one is faced with perpetual opposition, the pretensions of the landowners being such that lawsuits form the favorite pastime of many ambitious persons in these regions.

The Syndicate Aleman had some assays made, with the following results: Copper, 3 to 8%; zinc, 12 to 14%. Some work was done on a nearby property known as El Rosario, but the copper and zinc content proved low, and the work was abandoned. Last year J. C. Price, the manager of the Bolivar Railway Co., did some development on his mine in the Aroa district known as Camburito, and the samples (five tons), which were shipped abroad, gave good returns. Some work was also done in 1918 on a prospect on the Caribbean coast at Charco Pato, and copper carbonates were extracted. Development work was also done on a prospect near Carupano.

The republic has officially recognized 27 copper claims, with an area of 7500 acres, in addition to 10 claims pending, with a surface area of 5000 acres.

Magnesite Produced in 1917-1918

In 1917 the American Carbon Co., of New York, produced 1800 tons of magnesite from its property on the Island of Margarita, and, in 1918, it produced 600 tons. It shipped 1000 tons in 1917 and none in 1918. The Magnesite Products Corporation, of New York, during the months of September, October, November, and December, 1917, produced 560 tons, which it has ready for shipment; and suspended operations because of lack of shipping facilities.

Petroleum in Venezuela

In 1889 I examined the oil fields of South America for the late Secretary of State, James G. Blaine, and the late Daniel O'Day, of the Standard Oil Co., and then, years after, I published a portion of my deductions in *Mineral Industry*, Vol. 8. In this report I referred to Venezuela as a possible oil producer, and stated specifically that petroleum would be found in the region of the Rio Catatumbo, particularly on the eastern bank on the lands then owned by Don Silvestre Martinez; on the Rio Zulia, Sardinarte and Tara, and "in fact, good indications exist in the entire State of Tachira, in Venezuela, and the northeast section of the Department of Santander, Colombia, in the valley leading from the Lake of Maracaibo to the city of Cucuta." I mentioned the oil in the Motilenes Mountains, and near the town of Casigua in the State of Falcon. I concluded the synopsis report to which I refer with the following sentence: "From a commercial point of view, the Maracaibo district seems to possess the best outlook of the oil fields of Venezuela." I look upon the success of the recent developments in this region with a feeling of personal pride; however, there are other oil fields in Venezuela of considerable importance that have since been located.

I estimate the petroleum output (based on customs report on shipping tonnage arriving and departing in the service of the Caribbean Petroleum Co.) for 1918 at 26,400 metric tons. The commercial value of the oil produced for 1917 is $145,984 and $211,200 for 1918.

The completion of the great refinery at Curacao by the Dutch Shell Co. has given an outlet to Venezuela petroleum. The Caribbean Petroleum Co., under its contract with the government, is paying rentals on 60 petroleum claims with an area of 71,000 acres. This company's holdings are the most promising in the Maracaibo district, and it has a monopoly of that region. It is helped by the new mining law and the well-known policy of the government not to grant new concessions in this branch of mining. The company pays the government of Venezuela a rental of $5754.50 annually, and 20c. per ton for the petroleum extracted. The V. F. Oil Syndicate has 125 acres; F. J. Arraiz has 247 acres; and the Bermudez Co., 16,250 acres; the Colon Development Co., 1000 acres; and the Venezuela Oil Co., Ltd., 547.50 acres. The total area is about 4000 acres.

Asphaltum an Important Venezuelan Industry

ASPHALTUM PRODUCTION IN VENEZUELA FOR 1917 AND 1918

	1917		1918	
	Tons	Value	Tons	Value
New York & Bermudez Co...	52,991	$1,059,820	28,200	$564,000
The South American Co.....	68	1,360	50	1,000
Riopauji Mines.....	1,008	20,160	.....	.....
Totals.....	54,067	$1,081,340	28,250	$565,000

The value placed on asphaltum at the points of production is $20 per ton, and of petroleum, $8 per ton.

The Caribbean Petroleum Co. and the New York & Bermudez Co. are under the same management and are reported to be controlled by the Standard Oil Co. They form a monopoly in both products, so far as production in this country is concerned.

The success of the Caribbean Co. is due largely to the diplomacy and marked ability of Lewis J. Proctor, its manager, who has been able to harmonize the many difficult interests that always appear in a country like this, and to secure the sympathy of the people.

The asphalt concessions cover an area of 17,250 acres and are nine in number, including Guanoco Lake, that is controlled by the New York & Bermudez Co., and has an area of 12,000 acres, the rest of the lands being in the leases of the South American Company.

Coal Production for 1917 and 1918

During the year 1917 the coal mines that are the property of the national government and operated by it produced 22,686 short tons of lignite, divided as follows: mines of Nariqual, Capiricual, and Tocoropo, 17,379 tons; and the mines of Coro or Falcon, 5307 tons, the total output having a value at the mines of $10 per ton, or $226,860. This high price is due to the fact that, owing to the war, coal could not be imported.

The production in 1918 was approximately 26,800 tons—20,000 tons produced at the mines of Nariqual, Capiricual, and Tocoropo, and 6800 from Falcon, or the Coro Peninsula. The value of the coal at the mines was about the same as the previous year, or $268,000.

Coal sold in Caracas, La Guayra, and Puerto Cabello at $20 per ton, and it was difficult to obtain it in large quantities at any price. For the use of the railways it is briquetted, and in that form is not as objectionable as in crude state. The coastwise steamers that use this coal exclusively waste at least 60% of it for want of forced draft. The coal almost immediately disintegrates into a fine powder, and a roasting process goes on inside the fire box before combustion begins. The residue is a gummy substance that partly burns and partly clinkers against the grate bars, and closes what little air space is left. Under such conditions, one can well imagine what percentage of British thermal units contained in the coal are utilized. Burned under the boilers in the form of "powdered" coal, it gives splendid results, as proved by its use in a rotary kiln in Caracas.

In 1917 I investigated a coal field at Parapara, in the State of Aragua. Although the coal is far better than that which is being actually used, the geological formation is so broken that it would be a dangerous venture to attempt to work the mine, even were it not 60 miles from the nearest railway. Besides, the country is low and cannot be drained; and the mines cannot be operated at great depth, because of flooding.

In 1917 the government granted to A. C. Payne, of Philadelphia, a concession to build a railway, without subsidy, to some mines situated in the State of Zulia. Mr. Payne represented the Caribbean Coal Co., and under the grant it is purposed to work some coal deposits in the Guajiran Peninsula. These properties are known as Santa Rosa and El Filon del Espejo, and it is claimed that good coal has been found. For many years an attempt has been made to float a similar enterprise in London and New York, having in view the building of a railway from Rio Hacha, in Colombia, to the coal fields of the Guajira and the Sierra Nevada de Santa Marta. Good coal is found in the Andes in the State of Tachira, and on the Rio Meta, on the upper Orinoco.

I wish to express my thanks to Dr. G. Torres, Minister of Fomento, and Professor Francisco Azerm, Director of the Bureau of Mines and Mining, for their kindness in supplying me with data covering operations of the year 1918.

On Reconquered Soil*

The population of the liberated parts of France and Belgium can never show enough gratitude to Herbert Clark Hoover, the American engineer who was president of the Commission for the Relief of Belgium, to whose services as administrator of food supplies they owe the fact that they did not die of hunger during the long years of war.

Hoover is a well-known mining engineer, a member of the American Institute of Mining Engineers, the Mining and Metallurgical Society of America, the Society of Civil Engineers of France, and of other technical bodies. He is the author of some extremely interesting studies on the valuation, organization, and administration of metal mines, and we often consult his work entitled "Principles of Mining," which is considered an authoritative treatise on the subject.

When the Académie des Sciences Morales et Politiques presented to Mr. Hoover the Audiffred prize, appreciation was expressed in the following terms:

"The Audiffred prize has been presented to Herbert Clark Hoover, graduate of Leland Stanford University, California, a distinguished engineer who now represents the American Government as president of the Commission for the Relief of Belgium. On his appointment to this office Mr. Hoover immediately gave up his professional work so as to be able to concentrate all his energy on the care of the Belgian and French people in the invaded regions. He put so much ardor into his task that he earned the nickname of 'miracle performer.' With incomparable skill and calm tenacity he coped successfully with the situation created by the Germans, and succeeded in bringing relief to 10,000,000 souls. He imported more than four million tons of different supplies for Belgium and the North of France.

"Chosen as Food Administrator by the United States, he has aided the charitable work of his country to such a high degree that in the last 12 months he has been able to bring to Europe enough flour to feed 62,000,000 of the Allies. He has, besides, shown a wonderful spirit of resistance to the enemy. Remembering that 'man does not live by bread alone, but by the word of life,' he has added a real greatness to his valor and ability. We are happy to award the Audiffred prize for such wonderful devotion, which will surprise no one because we find it in an American who, like all his compatriots, was drawn toward suffering as by an invisible magnet."

Extending its work to the various nations delivered from the enemy's yoke, i.e., the Serbs, the Czecho-Slovaks, the Jugo-Slavs, and the Poles, the American Government, in agreement with the Allies, has just formed an inter-Allied committee for the relief of these countries. Naturally, President Wilson has appointed Mr. Hoover as director of this committee.

*From *L'Echo des Mines et de la Metallurgie*, Jan. 31, 1919.

Negligence Toward Mine Driver

By A. L. H. Street*

Plaintiff, while driving a mule train in defendant's mine, was injured through collision with a truck which timber men, engaged in their separate department of work, had left on the track without warning to plaintiff. He sued for damages, and the Washington Supreme Court holds that he was not debarred from recovering on the theory that the plaintiff and the negligent timber men were "fellow servants," within the rule of law exonerating an employer from responsibility for injury to one employee when caused by negligence of a fellow servant (Asbury *vs.* Hecla Mining Co., *175 Pacific Reporter, 179*). Being engaged in different departments of work, they were not "fellow servants."

It is also decided by the court that plaintiff is not to be regarded as having assumed the risk of the accident, he having suddenly come around a curve and suddenly encountered the danger, without any reason for supposing that the timber truck had been left on the track.

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Calibration of Base-Metal Thermocouples

By C. S. CROUSE*

Notes on keeping base-metal thermocouples and pyrometers in a condition for accurate temperature control, and a description of the equipment required. It has been found that the scientific adjustment of such apparatus has resulted in marked improvements in the treatment of steel; and, as other industries are interested in temperature control of such a kind, the paper should prove generally timely and informative.

THERE are so many industries at this time in which accurate temperature control, obtained by means of pyrometrical equipment, is required, that a description of suitable apparatus and data as to the method in use for calibrating base-metal couples should be of interest.

In general, there are three methods of calibrating such couples: (1) Calibration at a single point such as the freezing point of salt; (2) by immersion with a standard, in a bath of molten metal, such as tin; (3) by immersion with a standard couple, in a special furnace, the couples being checked against the standard, which is done by taking successive readings, after the temperature of the furnace has become constant, with a millivoltmeter, or a potentiometer reading directly in degrees.

The first process is more of a laboratory method than a commercial one, owing to the difficulty of keeping the salt chemically pure, the slowness of the process, and other drawbacks. The second method is of practical application on a commercial scale; but it is with the third method that this paper is concerned.

Method of Operation

In the plant which furnished the basis for the accompanying data, electric-resistance furnaces are used for the heat treatment of large-gun forgings, and it is desired to control the temperature to within 10° from the range of from 1000° F. to 1600° F. The furnaces are vertical, the couples being introduced into them through iron pipes slightly larger in diameter than the couple and extending through the wall of the furnace. The couple is thrust in until the hot junction is in contact with the forging, when the space between the couple and the pipe is plugged with clay. It is important that the plugging be complete, because if air leaks in around the couple it will cool it, and thus vitiate the reading. Lead wires run from the couples to Leeds & Northrup recording potentiometers, with a compensator for the cold-junction temperature.

The base-metal couples consist of one wire of iron and the other of constantan, and are made up in the plant, the wire being bought in rolls and cut to about 4-ft. lengths. The two wires are then twisted together for a few turns and the ends welded in an oxy-acetylene flame. This forms a small bead, which is the hot junction of the couple. The cold junction, as stated, is at the pyrometer. No couples are left in continuous service for more than a week without calibration, which process is explained in detail in a succeeding paragraph.

The company owns a platinum couple and one of platinum-rhodium. They have been calibrated to within 5° F. at the Bureau of Standards. It also operates a small, vertical-resistance type electric furnace, with a capacity of seven couples at an immersion of about 25 in. Two rare-metal couples are necessary so that there will always be one available in case the other is away being recalibrated.

Calibrating the Couples

The procedure in calibrating follows: Two iron-constantan couples are placed in the furnace with one of the rare-metal couples, care being taken to see that the immersion of all is the same. The couples are inserted through a hole in the asbestos cover, the remaining interstices being carefully plugged up with shredded asbestos. The furnace is then brought to a steady heat, generally between 1400° F. and 1500° F., and held there about a half hour, after which calibration begins.

The cold junction of the rare-metal couple is directly above the asbestos cover of the furnace, and a thermometer is placed at this point to register the temperature of the cold junction. The cold junction of the base-metal couples is extended, by means of lead wires, away from the furnace; and a thermometer, which is immersed in oil, is placed there. Oil immersion is adopted in preference to exposure to the air, because after oil once comes to room temperature it will not vary with air current, thus giving more nearly the actual temperature of the wire.

Lead wires from the couples connect to a multiple-throw switch, which in turn connects to a Leeds & Northrup Type K potentiometer. This instrument is accurate, and excellent results are obtained with it. The galvanometer of the instrument is then balanced on the standard cell, and readings are taken as rapidly as possible (to avoid any temperature changes in the furnace) on the rare-metal standard and the two base-metal couples successively. After a complete set of readings is obtained, another set is taken as a check on the first.

The readings are taken in millivolts, which are converted to degrees Fahrenheit, and the error, if any, for the base-metal couples is estimated. The couples are then tagged with their respective numbers and correction, and put away as secondary standards. These secondary standards are recalibrated from time to time, depending on the use they get, as may seem necessary.

An Example of Calculations Needed

A sample calculation follows:

Pt + Pt-Rh couple reading = 7.066 m.v.

Figuring from the standardization sheet furnished with the couple by the Bureau of Standards, it is found that 7.066 m.v. = 777.072° C.

Pt + Pt-Rh cold-junction temperature = 87° F. = 16.775° C.

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777.072° C. + 16.775° C. = 793.847° C. = 1460.924° F., which is the corrected reading for the rare-metal couple.

Iron + constantan couple reading = 44.236 m.v.

Iron + constantan cold-junction temperature = 74° F., which is converted, by tables furnished for this purpose by the Leeds & Northrup Co., into 2.130 m.v.

44.236 m.v. + 2.130 m.v. = 46.366 m.v. = 1471° F., which is the corrected reading for the iron-constantan couple. The conversion from millivolts to degrees is done with the same table used before.

Rare-metal couple reading = 1461° F.

Base-metal couple reading = 1471° F.

As the base-metal couple reads 10° F. higher than the true temperature, it is said to have a correction factor of (+) 10° F.; or, in other words, any temperature measured with this couple must be reduced by 10° F. to obtain the true reading. The secondary standards are used to do the bulk of the couple calibration, thus saving deterioration on the rare-metal couples and the consequent necessity for recalibration at the Bureau of Standards.

Use of Potentiometer

As stated, the couples in actual use in the furnace are checked against the secondary standards, and the procedure is not so painstaking as in the former case. Six couples and the standard are placed in the furnace,

ELECTRIC FURNACE IN CALIBRATING LABORATORY

which is then brought to heat, and readings are taken, first on the standard, then on No. 1 couple. This is checked, and the operation is repeated until all the couples are calibrated. The proper correction is then made for the error in the standard, and the couples are tagged with their respective numbers and corrections and put away ready for use. The Type K potentiometer is not used in this case, there being employed, in its stead, a portable potentiometer, with a compensating cold-junction coil, which reads directly in degrees Fahrenheit. This potentiometer is, from time to time, checked back against the Type K potentiometer to see that it is holding its accuracy. If it is found to be "off" an allowance is made for the amount.

It has been argued that this method of checking couples is not accurate, and that they should be checked in the furnace and under the conditions in which they are used. This is because the couple may not be homogeneous throughout its length—a condition which would be likely to affect the readings under dissimilar conditions. For instance, if the couple were homogeneous for the first 1 ft. of its length back from the hot junction, and not for the next 1 ft., it is manifest that different readings would be obtained should 6 in. or 2 ft. be exposed to the heat of the furnace.

This condition is overcome, or at least rendered negligible, because the depth of immersion of the couple under working conditions and in the check furnace is approximately the same. This being the case, even though the couple be not homogeneous, the same relative reading is obtained under both working and checking conditions.

Complete Records Are Kept

A record is kept of the length of service of each couple between calibration dates and, on the same card, the different correction figures obtained at each time of checking. The deterioration of couples at the plant mentioned is probably not as great as would be the case if gas- or oil-fired furnaces were used, owing to the fact that there are no gases in an electric furnace to attack the couple chemically, the only deteriorating element being the heat. The results of the observation of a number of couples over a period of months, however, seem to show that there is a point up to which the couples show no deterioration, and after which deterioration is rapid. The couples do not seem to deteriorate in any regular ratio or manner, but after about 25 days of service they cannot be relied on without frequent calibration.

Results of the Tests

The results obtained may be outlined thus: Of 52 couples on which observations were taken, 15 showed deterioration and 37 did not. Of the 37 that failed to show deterioration, 35 were in use less than 25 days. Of the 15 couples that did show deterioration 13 were in use 25 days or more. Of these 15, six were again placed in use for a few days, and further marked deterioration was found on recalibration. The above-mentioned couples were calibrated on an average of once every seven days, and an error of not more than 5°, over a number of calibrations, was not considered as deterioration, because this amount is within the allowable calibration error.

Each furnace is equipped with six rows of nichrome ribbon, through which a three-phase, 220-volt, alternating current passes, the resistance offered by the ribbon furnishing the heat. The upper and lower three rows of ribbon act independently of each other, thus necessitating two potentiometers to the furnace. Short couples are inserted with their hot junction as near these ribbons as possible, and these give a ribbon temperature, whereas couples touching the work in both the upper and lower zones of the furnace give the work temperature. Thus each recorder registers on two couples, one ribbon, and the other work, the change from one to the other being made by means of a split cylinder in the potentiometer and taking place every 45 seconds. As a result there are two curves on each chart, one giving the ribbon temperature and the other the work.

While the charge is coming to heat, the ribbon curve shows the higher temperature and both show a regular rise, whereas after the charge is at heat the work curve will be the higher, as a general rule, and show a straight line, while the ribbon curve will be jagged, due to the fact that the power is continually going off and on, and

the ribbon, as a consequence, is cooling down and heating up again. The mass of the forging prevents it from cooling during the comparatively short time that the power is off.

Controlling the Temperature

The temperature is controlled by a finger and movable disk, an arrangement incorporated in the potentiometer itself whereby the current will go off at any desired temperature and go on again when the temperature drops below that desired.

This automatic power control works on the ribbon temperature. In other words, when the ribbon shows a certain temperature the power goes off, and when it shows a certain lower temperature the power goes on, this gap being capable of regulation, thus keeping the forging at the desired temperature. Every morning these recorders are checked up as to straightness of recording pen and balance of galvanometer needle; also, whenever a charge is at heat the potentiometer itself is checked against a standard portable instrument, and very little fluctuation is found. This checking is done by reading, with the same couple, first on the recorder and then on the standard instrument, and, as the furnace is at heat, this practically eliminates the error due to temperature fluctuations.

Of course, in reading the chart on the recorders an adjustment must be made for the correction factor of the particular thermocouple in use at the time.

In addition to the four couples, two in each zone, which must be in each furnace to serve the recorders, one or more check couples are used which register on a Leeds & Northrup multiple-point potentiometer. This is used exclusively as a check on the recorder readings and is, in turn, checked in the same manner as are the recorders.

All of the equipment is in charge of a technical graduate, who devotes most of his time to this work, and an assistant, who devotes all of his time to it, but the expense is amply justified by the close temperature-control obtainable and the resultant excellent effect of the treatment on the steel.

Manganese-Ore Production in 1918

Reports made to the Geological Survey by operators of manganese deposits up to Nov. 30, 1918, indicate that the highest rate of production of all grades of ore was attained during the third quarter of 1918 and that shipments declined rapidly after the armistice was signed. During 1917 the quarterly rate of production of ore containing more than 35% of manganese reached a maximum of 50,906 tons in the third quarter, and the total production for the year was 128,053 tons. In 1918 the rate of production continued to rise, reaching 90,738 tons in the third quarter, and the present estimate for the year is 294,000 tons. Shipments of ore containing 10 to 35% of manganese attained the maximum of 288,180 tons in the third quarter of 1918, and the present estimate of shipments for the entire year is 831,000 tons.

The increase in the shipments of high-grade ore during the third quarter of 1918 is almost entirely to be attributed to the increase in the output of the mines of the Philipsburg and Butte districts, Montana, for the shipments from every other state, except Georgia and Tennessee, were less for the third quarter than the maximum, which in most districts was attained during 1917 or early in 1918. The shipments from the Philipsburg district steadily increased from 1916, when the manganese deposits there were first exploited, to the third quarter of 1918, when 35,998 tons of ore was shipped. Recent investigations by a geologist of the Geological Survey show the existence of large reserves of ore in that district. The first shipments from the Butte district were made in 1917, and the output of that district during the third quarter of 1918 was 24,097 tons.

As most manganese deposits are exploited by surface workings, and lack good transportation facilities, and as the concentrating mills at many others require an abundant supply of water, the rate of shipment varies with the season, a fact which, considered in connection with the railroad embargoes that prevailed early in 1918, explains the relatively low rate of shipment during the first quarter of 1918 from California, Virginia, Arkansas, and Georgia.

The shipments of low-grade ore from the Cuyuna district, Minnesota, during the third quarter of 1918, were 329,416 tons, the highest on record, whereas those from the Leadville district, Colorado, were 19,859 tons, which shows a great decrease from the maximum, 31,000 tons, shipped in the first quarter of 1918.

The imports of manganese ore for the eleven months ending Nov. 30, 1918, reported by the Bureau of Foreign and Domestic Commerce, were 469,919 tons, of which 329,360 tons was received from Brazil, 79,390 tons from Cuba, and 29,275 tons from India. The imports of ferromanganese for the eleven months ending Nov. 30, 1918, were 26,991 tons.

DOMESTIC MANGANESE AND MANGANIFEROUS ORE SHIPPED IN NINE MONTHS ENDED SEPT. 1, 1918

State	Ore Containing 35% Mn or More: Number of Shippers	Ore Containing 35% Mn or More: Gross Tons	Ore Containing 10-35% Mn: Number of Shippers	Ore Containing 10-35% Mn: Gross Tons	Ore Containing 5-10% Mn: Number of Shippers	Ore Containing 5-10% Mn: Gross Tons
Alabama	1	411	3	307	.....	.....
Arizona:						
Bisbee district	6	10,643	1	929	.....	.....
Other districts	15	3,315	(a) 5	(a) 4,776	(a) 1	(a) 6,082
Arkansas: Batesville district:	16	6,865	15	7,748	.....	.....
California	36	17,520	1	31	.....	.....
Colorado:						
Leadville district	1	1,150	(b) 12	(b) 80,663	(b)	(b)
Other districts	1	67	.....	.....	.....	.....
Georgia	9	5,082	8	7,554	2	1,084
Michigan	.....	.....	1	16,940	.....	.....
Minnesota:						
Cuyuna district	.....	.....	10	452,757	4	182,300
Mesabi district	.....	.....	.....	.....	.....	.....
Montana:						
Butte district	7	53,083	.....	.....	.....	.....
Philipsburg district	23	94,310	.....	.....	.....	.....
Other districts	2	90	.....	.....	.....	.....
Nevada	14	17,474	(a) 3	(a) 56,630	.....	.....
New Jersey	1	64	(c)	(c)	.....	.....
New Mexico:						
Silver City district	1	120	2	18,135	.....	.....
Other districts	6	2,151	.....	.....	.....	.....
North Carolina	1	315	.....	.....	.....	.....
Oregon	1	176	.....	.....	.....	.....
South Carolina	1	100	1	850	.....	.....
South Dakota	1	31	.....	.....	.....	.....
Tennessee	17	2,376	9	1,798	.....	.....
Texas	1	308	.....	.....	.....	.....
Utah	11	4,639	.....	.....	.....	.....
Virginia	20	8,611	14	7,624	2	4,802
Wisconsin	.....	.....	.....	.....	(d) 1	(d) 193,418
Totals	192	228,901	(ac) 83	(ac) 595,708	(ad) 8	(ad) 188,186

(a) Ore from Arizona, Colorado, and Nevada, used for fluxing, not included in totals for United States. (b) Fluxing ore not reported and not included in totals. (c) Residuum not reported and not included in totals. (d) Ore from Wisconsin containing approximately 5% manganese not included in totals.

Export of Yunnan Tin from Hongkong*

The heavy demand for South China tin which prevailed during 1918 resulted in the largest export of tin from Hongkong—the entrepôt of the trade—in its history, and led to agitation for increased output, according to Consul General George E. Anderson, writing from Hongkong under date of Nov. 19, 1918. The matter is one of extreme importance; for, though most of the tin now produced in South China comes from a few deposits in Yunnan Province, the field generally is so great and the deposits of ore in Yunnan, near Mengtze, are so rich that there would be a large addition to the world's supply of this metal if certain surmountable conditions should be overcome.

All of the tin now produced in South China, with the exception of inconsiderable amounts from various small workings, comes from the Ko-Chiu mines, near Mengtze, in the southern part of Yunnan Province. Up to a short time before the war, these mines were worked entirely by native methods, and, in fact, most of the actual mining at the present time is according to those processes. In 1912, however, certain German interests, combined with Chinese capitalists, put in more modern equipment, and since that time most of the output of the mines has been smelted in these plants. The tin is then shipped to Hongkong, where it is refined. Practically the whole of the output follows this course and is exported only through Hongkong.

At present the production depends entirely upon the amount of water available for washing the ore. The tin is extracted during a comparatively short season, beginning in February and ending in May. When there is a prospect of a wet season the amount is comparatively large. During the last extraction season a special effort was made, and the wet season which followed enabled production to reach the maximum point under present conditions.

At various times attempts have been made to secure sufficient coöperation among the tin interests and among the Chinese officials to establish a system of waterworks, which experts report could readily be done at a comparatively low cost. Five years ago an American engineer worked out a complete plan for such an interprise, but nothing came of it.

About two years ago an attempt was made by the Anglo-French-China Corporation to buy the ore and ship it elsewhere for smelting and refining. The plan was a failure, for the reason that the mine owners demanded prices which made the scheme impracticable. The industry is in the control of a strong syndicate, which in turn has close relations with the Ko-Chiu smelters and with the refiners in Hongkong. There was strong opposition to the proposal to ship the ore before smelting, because it would mean the ruin of the works at Ko-Chiu and its trade in other lines and because the government would lose a revenue of about $500,000 annually.

A second attempt was made by the Straits Trading Co., of Singapore, a year ago, with no better results. Agitation is now being carried on with a view to securing the export of such ore as the mines turn out or can turn out over and above the amount which, with the available water supply, can be washed during the current season and which the smelters cannot handle. The export of unwashed ore would be too expensive to be successful, but it would be possible to transport the original ore to the Ta Tung Lake district, where it could be washed and concentrated, and whence it could be exported. Although such a method would probably interfere materially with the course of the trade through Hongkong, it would increase production indefinitely.

The exact output of the Ko-Chiu mines cannot be accurately ascertained, as the work is carried on without proper superintendence, is scattered over a wide area, and is in the control of various owners. The customs returns show the export of a little less than 12,000 short tons of the metal in 1917; the returns so far as available indicate an output in 1918 of perhaps 14,000 short tons. The mines are by far the most important and most profitable enterprise of the sort in South China, if not, indeed, of the whole country.

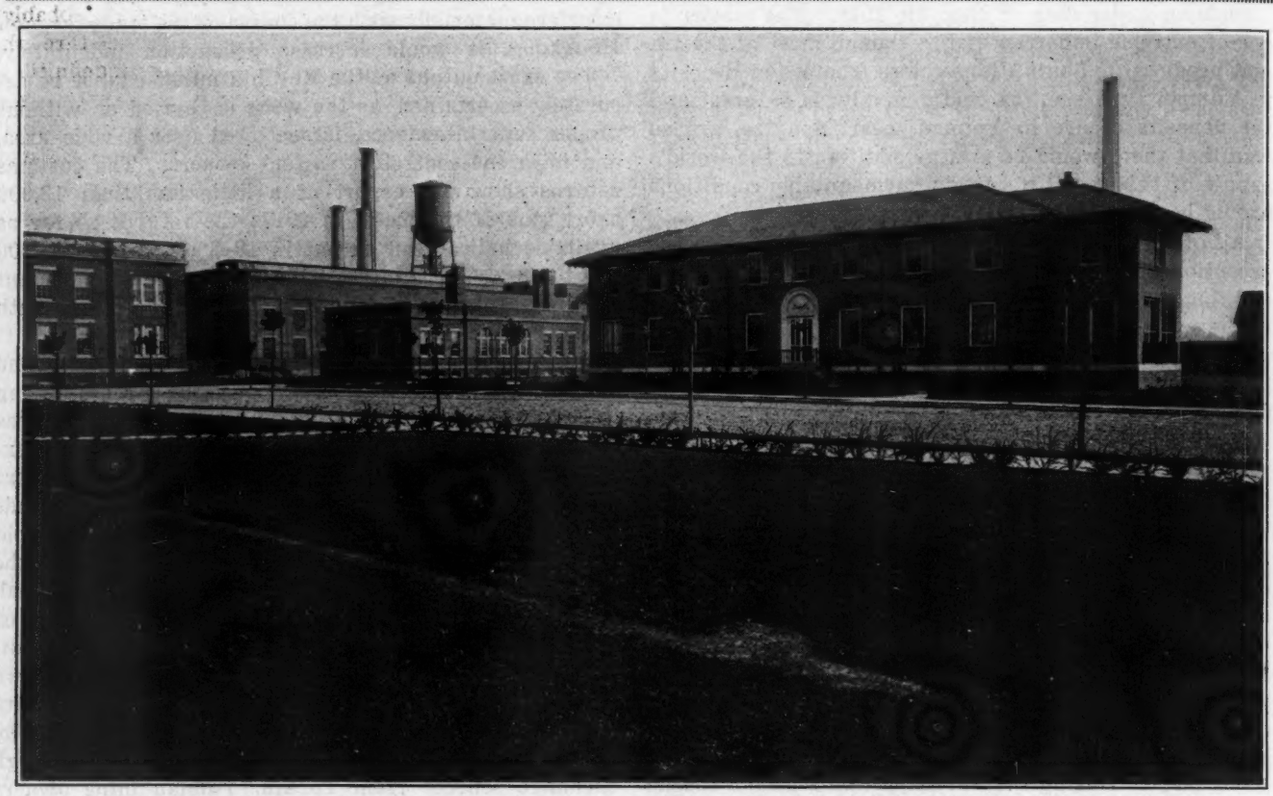
Despite the high price of tin in the United States and Europe, the return to the Yunnan mine owners during the war was not at all exceptional, and at times was rather below normal. The high value of silver in exchange with gold reduced the return to the operators in silver (in which metal costs are made and dividends declared) to a little more than half the return the gold values would normally indicate, or, in other words, the price actually realized in silver was little below normal. On the other hand, the prohibition of the export of silver from Hongkong and Tonkin was a serious handicap to the industry, for Yunnan depends upon these two sources for its supply of silver. With the impossibility of securing payment for tin exports to Hongkong by the importation of silver from Honkong or through exchange sources from Tonkin, Yunnan mine owners and other Yunnan traders were compelled to import silver from Shanghai at a premium which at times ranged from 2 to 12%, thus reducing the earnings of the mines by that amount. Under fixed exchange or at a fair rate of the silver dollar, such as that obtaining under fixed exchange in the Straits Settlements—with whose product of tin the Yunnan product competes—the return to Yunnan mine owners the last two years would have done much to set the whole business world of southwest China on the road to prosperity. Under present conditions it has merely served to prevent commercial disaster.

*Commerce Reports, Jan. 9, 1919.

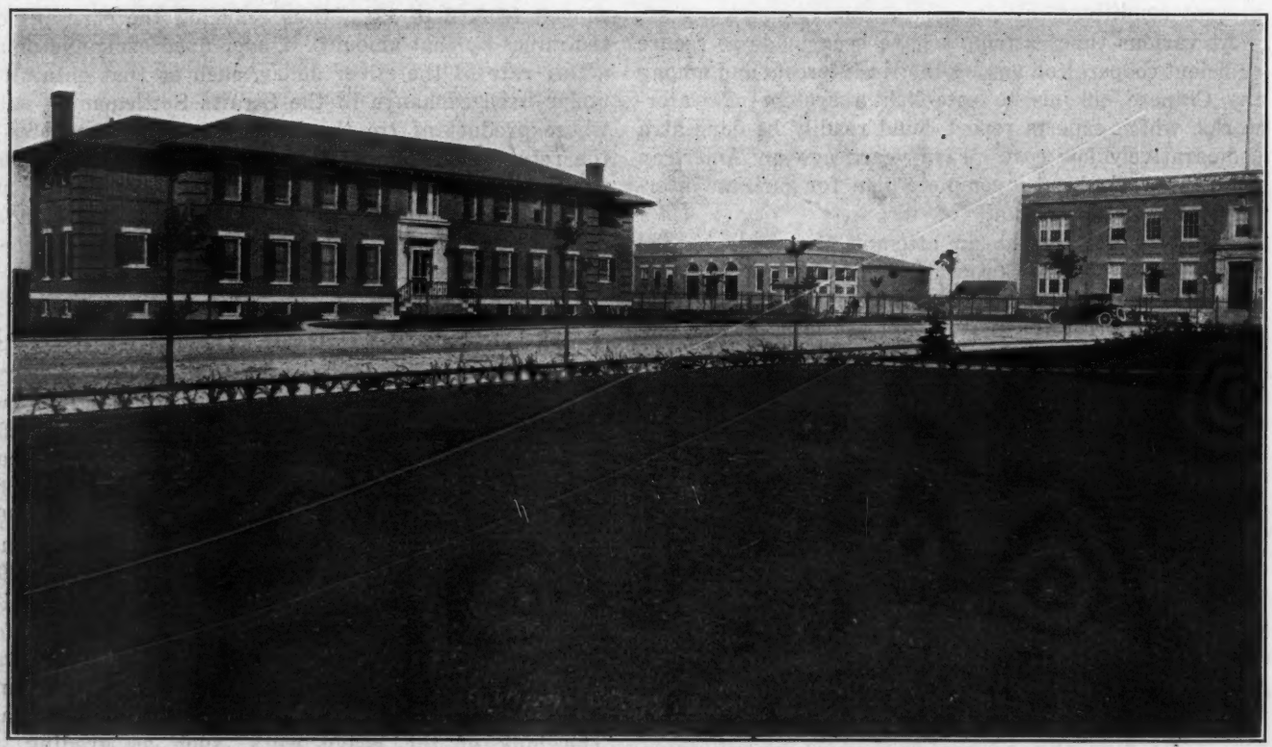
Three Years To Finish Alaskan Railroad

With labor and material now available, the Government is preparing to rush work on the Alaskan railroad. Secretary Lane asked Congress on Feb. 8 for $13,800,000 to complete the job. The Alaskan Railroad Commission estimates it will require three years. The appropriation of $13,800,000 asked includes $4,000,000 of the original estimate of $35,000,000 for the construction of the road, and a deficiency appropriation of $9,800,000, representing the increase in the cost of materials. It is estimated the road can be finished for $44,800,000. Though work never was stopped, it was slowed down materially by the war. Several thousand applications have been received for work on the road. The bulk of the heavy work, such as grading, is virtually complete now.

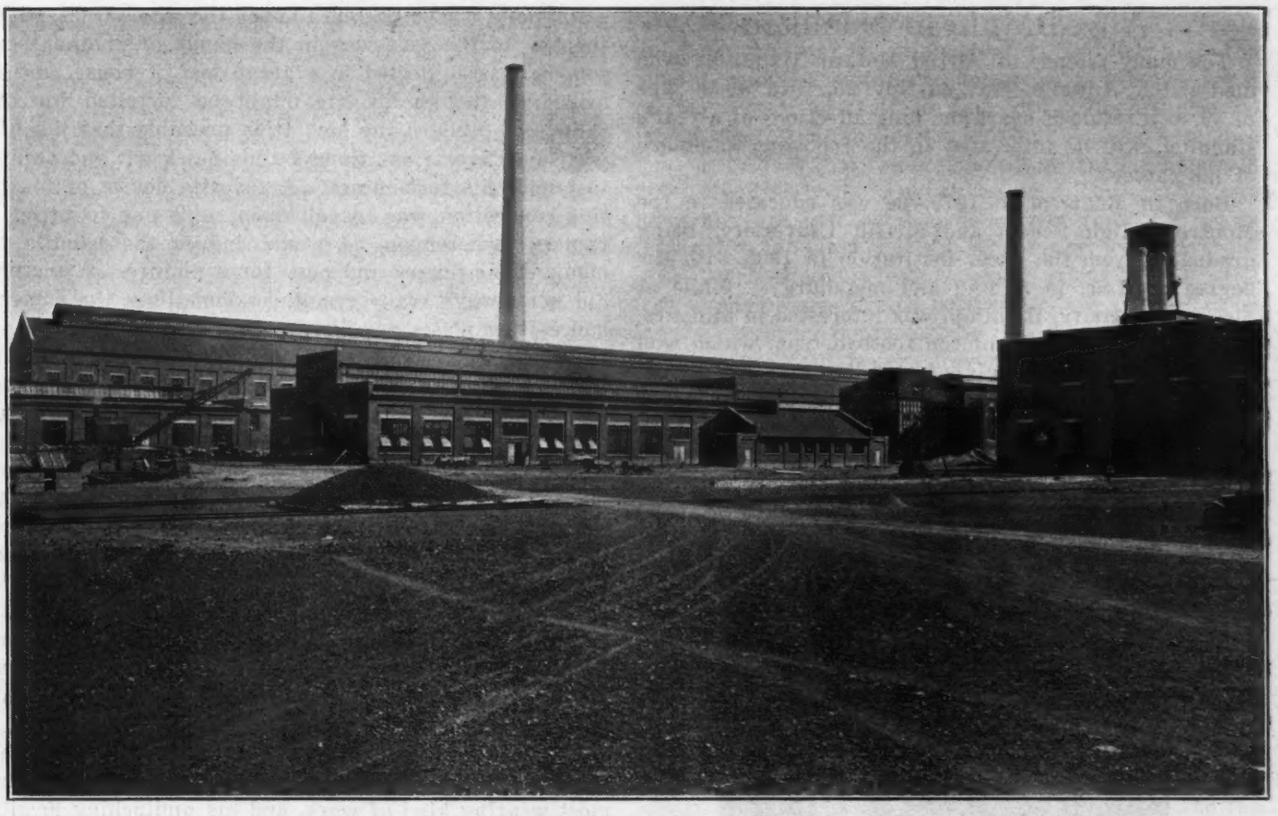
International Nickel Co., Port Colborne



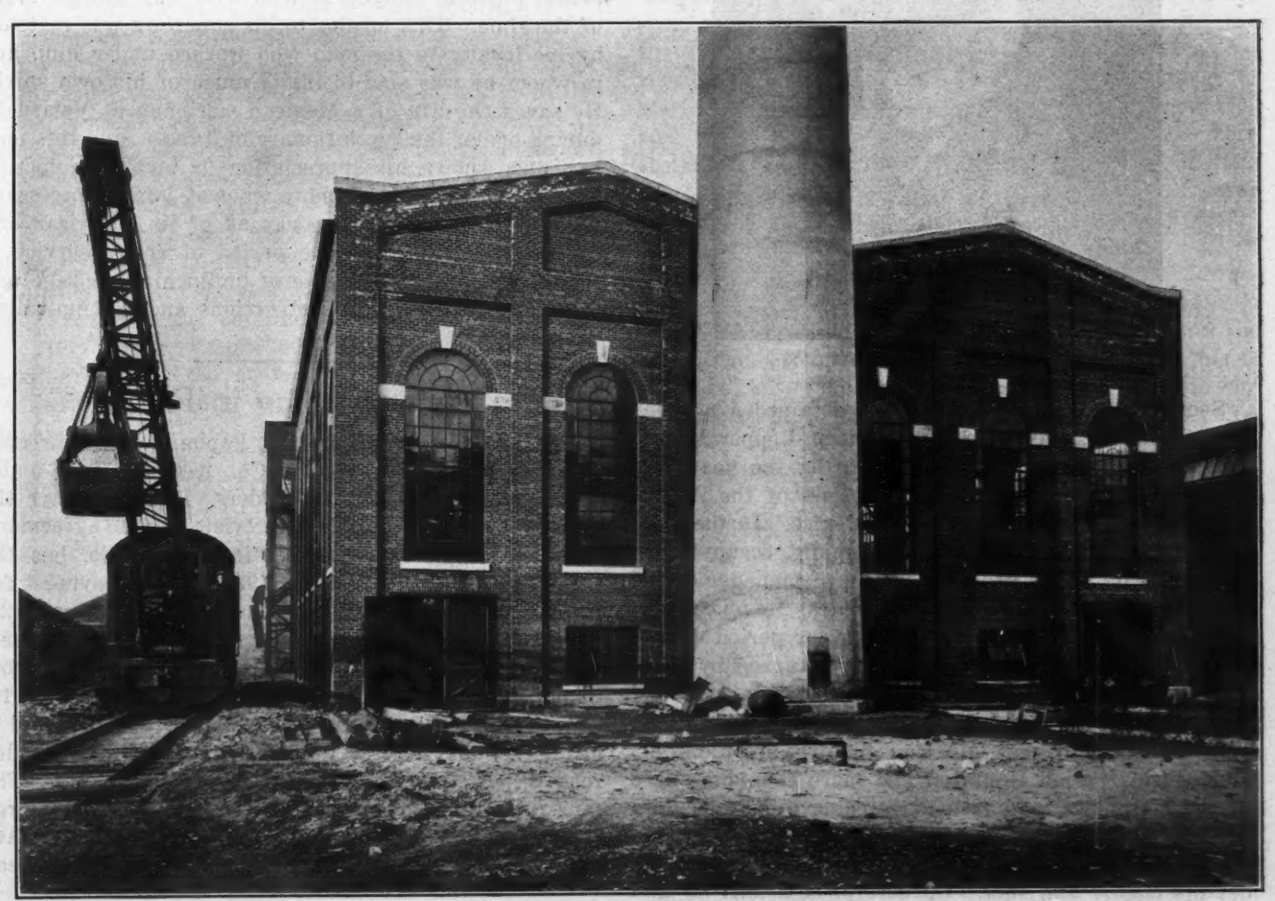
ADMINISTRATION BUILDING (LEFT), REFINERY, LABORATORY, AND CLUBHOUSE OF INTERNATIONAL NICKEL COMPANY, PORT COLBORNE, ONTARIO



LODGING HOUSE (LEFT), TIME OFFICE, AND ADMINISTRATIVE BUILDINGS AT INTERNATIONAL NICKEL COMPANY PLANT



MACHINE SHOP AND REFINERY (RIGHT) OF INTERNATIONAL NICKEL COMPANY, SHOWING AMPLE SPACE FOR POSSIBLE PLANT EXTENSION



POWER PLANT OF INTERNATIONAL NICKEL COMPANY, LOOKING NORTH

Alfred McLean Hamilton

The many friends of Alfred McLean Hamilton, who died at San Antonio, Tex., on Nov. 25, 1918, at the age of 39, as a result of heart and lung affections of a year's standing, will be interested in the following summary of his career:

Born in Montreal in 1879, he was educated in the Montreal High School and McGill University, being graduated from the latter institution in 1905 with the degree of B.Sc. in mining and metallurgy. While at McGill University, Hamilton was interested in athletics, and was made captain of the football team which won the Canadian intercollegiate championship. As his occupation in life he selected metallurgy, and made the most of all opportunities to gain knowledge and experience aside from that which the university could furnish, spending his summer vacations at smelting works in Mexico and Montana, and working at hard labor in any department which might be open to him.

ALFRED McLEAN HAMILTON

Soon after graduation, Hamilton obtained a position in the Washoe smeltery of the Anaconda Copper Mining Co., which, however, he gave up during the next year to identify himself with the enterprises of the American Smelting and Refining Co., in Mexico. In the service of that company he advanced rapidly, occupying in the last years of his life the position of manager of the plants at Velardeña and Aguascalientes, Mexico.

The greater portion of the twelve-year period during which Hamilton was in Mexico was disturbed by revolutions and counter-revolutions, with many murders, executions, raids, and hold-ups by bandits, with which all students of recent Mexican history are familiar. During this period Hamilton had more than his share of these troubles, and frequently came into immediate personal contact with raiding bandits. At one time six men were lined up against the wall of the plant under his charge and shot. On several occasions he was held up by bandits who rode into the plant and at the pistol point compelled him to open the safe. Once, when the key to the safe was in the hands of another person, he was subjected to a great deal of abuse, and it looked as though his life might be forfeited for his failure to produce the key. It is probable that his life was saved at various times by his quick wit and ability to humor his tormentors. A favorite device of his in this connection was to call upon some one to bring a camera; whereupon he would induce the bandits to mount their horses and pose for a picture. A picture did not always really result, as sometimes the camera had neither plates nor films.

During these troubled times it was a most difficult task to keep the plants in condition to operate. The people in many instances were starving, and arrangements had to be made for the planting of corn. The railroads were unable to furnish cars for the movement of supplies of ore, coke, and other materials, so that it was necessary to undertake for company account the rebuilding of hundreds of cars and many locomotives in the shops of the smelting works. It was difficult to do enough of such work to keep pace with the activity of the revolutionists in burning cars and blowing up locomotives. Other handicaps were the many and various taxes levied by the constantly changing Mexican governments.

It will be seen that though Hamilton's career was short, it was filled to the brim with the hardest and most wearing kind of work, and his unflinching loyalty to his company is shown by his sticking at it through so many years, in spite of all the discomforts and the actual physical danger to which he was subject much of the time. This loyalty to his superiors was matched by his loyalty to the men who worked under him, and in whom he was able to instill much of his own spirit. He saved the life of a Mexican workman at Velardeña during one of the revolutionary outbreaks, and this man has since shown his appreciation by loyally protecting the property of the company when it became necessary for the company to take away all of its American employees. Hamilton's whole period of active service is a most conspicuous example of unflinching courage and energy in carrying out instructions and accomplishing results.

Copper Mining in Papua*

The Laloki copper mine, in Papua, which was once owned by the Great Fitzroy Co., has been held under option from the debenture-holders. Recently, says the *Australasian*, there has been a revision of the agreement, with the result that the existing Laloki Co. has the right to pay £10,000 in June, 1920, in part payment for it, £10,000 in June, 1922, and the balance in June, 1925.

The directors, in the chairman's report just issued, point out that the mine is situated about two miles from Sapphire Creek and 18 miles from Port Moresby. Its elevation is about 400 ft. above Sapphire Creek, and it has been found necessary to construct a suitably graded road to permit of the carriage of stores and ore. The construction of this road is now proceeding. Two large steam tractors, capable of hauling 20-ton loads, have been purchased; and, when the road is completed, cheap

*Abstracted from the *Queensland Government Mining Journal*, Nov. 15, 1918.

facilities will be available for the transport of ore. Owing to the rough character of the country in which the mine is situated, it has hitherto cost upward of £6 per ton to pack and cart material to Port Moresby. Under the altered conditions, it is hoped to deliver ore to Port Moresby for about 15s. per ton. The board also has discovered a suitable route for a railway to the field, and is in touch with the Commonwealth government on the subject. A good deal of development work has been done at the mine, and, as the 230 ft. east crosscut has disclosed a run of from 8 to 10% copper ore, it is purposed to make shipments of this material. The revenue so obtained will help to carry out development and other work. Experiments have shown that the ore can be cheaply roasted, the calcined material leached, and the copper and zinc electrolytically deposited. A high extraction of the metal contents of the ore is expected with a utilization of its sulphur contents. The board states that it has abandoned the Elvira option on the field.

Income Tax Due

Work on collecting the $6,000,000,000 that it is estimated the new War Revenue Bill will yield has been started by the Bureau of Internal Revenue. The income-tax provisions of the bill affect every single person in the United States with a net income of $1000, and every married person whose net income is $2000 or more. In addition to these exemptions, taxpayers are allowed an exemption of $200 for each person dependent upon them for chief support, if such person is under 18 years of age and incapable of self-support.

Income-tax returns must be filed with the local collector of internal revenue on or before Mar. 15. Failure to file such return will result in a fine of not more than $1000 and an additional assessment of 25% of the amount due. Heavier penalties are prescribed for wilfully refusing to make return on time or for making a false or fraudulent return.

Payment of the tax may be made in full at time of filing return or in four installments on or before the following dates: Mar. 15, June 15, Sept. 15, and Dec. 15. Failure to pay on time will render one liable to a fine of not more than $1000 and an additional assessment of 5% of the amount unpaid plus 1% interest for each full month during which the tax remains unpaid.

Economizers in Steam-Boiler Plants

Under the title "Exact Data on the Running of Steam-Boiler Plants—No. 1, Economizers," is published[1] a comprehensive treatise on the subject by D. Brownlie, J. Compton, and H. W. Royse. It is the intention of the authors to present a series of articles dealing with general methods of steam-plant operation, based on 10 years' experience in the investigation and reorganization of steam-boiler plants in Great Britain. Though the statements made refer to British plants, it may be assumed that similar conditions prevail in this country, and several of the points emphasized in this first paper are well worth consideration.

The chief advantage and the main point of interest in connection with economizers is the saving of fuel, and, although it is generally stated that this amounts to from 15 to 25%, investigation showed that 155 plants equipped with economizers obtained an exact average saving of 11.4% in fuel cost. This low average is not due to the fault of the economizer as an appliance but to the fact that the economical generation of steam on a scientific basis is not understood, and economizers generally are not installed on correct lines. Properly utilized, it is stated that the economizer, under average conditions, should effect a saving from 17½ to 20%. Other advantages of the economizer are the reduction of the strain on the boilers by the provision of a high-temperature feed water, preventing unequal expansion and contraction, and also that there is always a large reserve of hot water for any sudden demand for steam. Furthermore, the evaporative capacity of the boilers is greatly increased.

Among the disadvantages to be considered is the serious choking of the draft caused by the cooling of the gases. The draft in a chimney, other things being equal, is dependent on the mean temperature of the gases in the chimney and is caused by the difference of the density of the hot gases in the chimney and the cold air outside. Theoretically, if more economizers are installed, the draft would be so seriously diminished that hardly any coal would be burned. The reason is that the chimney, as a draft producer, is a wasteful method of creating a draft, and, for its efficiency, depends on a great waste of heat. If this heat is utilized to the full by the economizer, the draft is curtailed and it is impossible to burn the necessary amount of coal to maintain the evaporation, in spite of the assistance of the economizer. Hundreds of boiler plants are forced, for this reason, to open the bypass dampers and allow a portion of the hot gases to go straight up the chimney to waste, so as to maintain a draft to burn the amount of coal required to keep up steam. Therefore the mere installing of economizers in some cases may be of little real advantage. This difficulty is, however, of little or no practical importance when a mechanical draft is employed.

Another disadvantage of the economizer is the formation on the inside of the tubes of a hard deposit of scale from impurities in the feed water, which prevents the conduction of the heat from the hot gases, and this is likely to cause the tubes to be burned out. But this condition may be avoided by softening the water and delivering it to the economizers at not over 5 or 6° of hardness, which is sufficient to eliminate all incrustation troubles. A further source of trouble is the corrosion of the pipes which is caused by the condensation of the acid flue gases on the outside of the tubes at the lower end where the cold water enters. Flue gases contain sulphurous acid from the sulphur in the coal, which condenses because of the great difference in temperature. This corrosive action is intensified by excessive sulphur in the coal and the moisture in the flue gases due to damp flues or excessive amounts of steam being used for steam-jet furnaces. One means of preventing this is to make sure that the feed water does not enter the economizer at less than 100° F., and this may be done by providing an automatic circulating arrangement that will continuously take a small portion of the water from the hot end and mix it with water from the cold end.

[1]Reprinted from *Engineering*, Nov. 1, 1918.

Details of Practical Mining

Frequently unknown beforehand, conditions encountered in diamond drilling that often result in the loss of equipment call for ingenious methods on the part of the drill operator. A following article describes some of the experiences met in putting down a drill hole. Two unsuccessful attempts were made to recover the apparatus, but a third trial resulted in the saving of the entire equipment.

The sketch and description of a "Simple Mine Cageway Gate" suggests safe practice in underground operations, and such a device need not be confined to hoisting shafts, as may be intimated. Safety regulations in most mining districts demand that all openings to chutes and raises be guarded, as well as openings to shafts, and such a device will be found to have considerable application in this particular. By means of offsetting either end of the suspension straps, the gate may be made self-closing.

The underground loading or shoveling machine represents one of the recent developments of mechanical endeavor in the mining field, and considerable success has been obtained by the various models that have been placed on the market. Particular conditions are encountered in underground operations, and it is not strange that the requirements needed for a successful underground loader should be different than those that are demanded in other work.

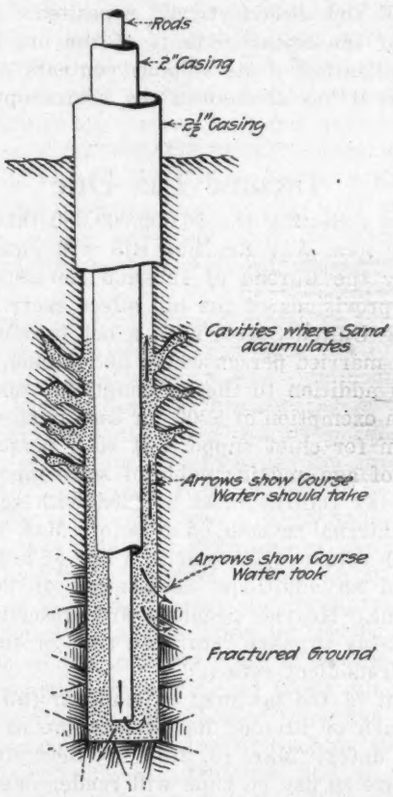
Diamond-Drill Troubles

Some of the difficulties encountered in diamond drilling are told by Maxwell C. Milton in the January issue of *Ax-I-Dent-Ax*, the safety publication of the U. S. Smelting, Refining and Mining Company.

A diamond-drill hole put down at the Mammoth mine, Kennett, Calif., occasioned considerable trouble to the drill men. The first 160 ft. of drilling showed typical conditions; the rock was somewhat soft for 90 ft., and was cased. Below this the rock was firm and casing was discontinued. At about 170 ft. the rock became decomposed, the feldspar being reduced to a clay-like substance which held the hard quartz crystals loosely in place, and trouble began.

As the hole progressed through this material the wash water flushed out the soft clay, releasing the quartz grains, which were washed out of the hole with difficulty. This condition did not make drilling unduly dangerous so long as the wash water continued to circulate freely. As the rock became harder at 220 ft., the hole was continued without casing.

At 327 ft. the rock seemed to be badly fractured, and this condition allowed the wash water to run out from the bottom of the hole as fast as it could be pumped in. Technically speaking, the men "lost the water." At once all the sand held in suspension settled around the rods, and they began to bind. During this critical time the power went off for about 15 min. and the bit was stuck. All the usual devices for turning the rods with wrenches and pulling with the combined power of the machine and jacks were resorted to without success. In fact a



CONDITIONS ENCOUNTERED AT A DIAMOND-DRILL HOLE AT KENNETT, CALIFORNIA

pull was put on the rods nearly equal to the strength of the threads between lengths of rod. At this stage, the company faced an investment loss of $900 in equipment and $800 in labor, and the hole still lacked 50 ft. of being deep enough to reach the favorable horizon for ore.

The next step was to go down with casing on the outside of the rods in an effort to shut out the sand coming from 170-ft. and 220-ft. levels, and to drill out the accumulations around the bottom of the pit. However, the casing seemed to aggravate the bad conditions started by the rods. The accompanying sketch shows the conditions that, from the evidence, existed. The cavities made by the wash water which acted as reservoirs for the quartz sand are especially to be noted. During this time only one shift operated, so progress was slow and much of the time was spent in getting through the sand. However, by hard work the 2-in. casing was forced down to 312 ft., where the water

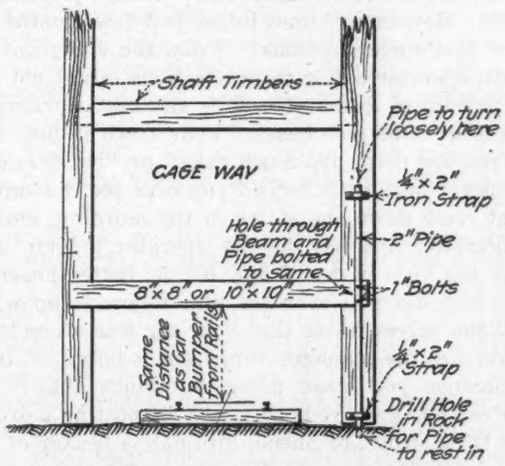
was lost again. Losing the water in firm rock is not necessarily dangerous, but in this sandy material it obviously made the work distinctly hazardous. The chances for sticking the casing increase greatly with the increase in bearing surface and to some extent with the additional weight the machine has to handle. As everything was working under a strain, it was not altogether remarkable that something should break and that the casing with bit No. 2 should become stuck.

The company now had an investment in the hole of $2500. It was a question of whether to stand this loss or risk more in an attempt to rescue the bits and equipment, and the latter was finally decided upon. The third hole was started with 2½-in. casing over the other two. This time the men got down after several weeks of extremely hard work and with many narrow escapes from sticking the third bit. With the perversity of inanimate things, a bad hole was made worse. The weather changed suddenly. Snow followed rain, temporary pipe lines to the drill tried to freeze, and electric service (the primary power), was interrupted at critical times, but the equipment was saved.

A Simple Mine Cageway Gate

BY ROY H. POSTON*

An easily constructed mine cageway gate that may be made by the mine carpenter in a short time is illustrated in the accompanying sketch. The first cost is low, the upkeep inappreciable, and its use may be well adapted to the small or temporary mine.

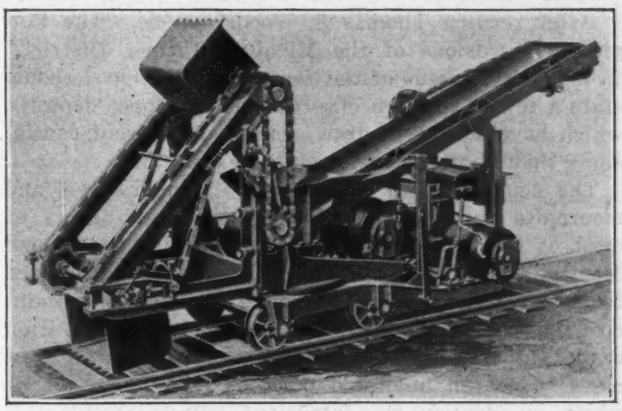

Shaft Timbers
Pipe to turn loosely here
CAGE WAY
¼"x 2" Iron Strap
Hole through Beam and Pipe bolted to same
2" Pipe
8"x 8" or 10"x 10"
1" Bolts
Same Distance as Car Bumper from Rails
¼"x 2" Strap
Drill Hole in Rock for Pipe to rest in

CAGEWAY GATE FOR SMALL MINES

A Continuous Twin-Scoop Loader

Among the types of underground ore-shoveling or ore-loading machines of recent development is the McDermott Continuous Twin-Scoop Loader, which has been placed on the market by the Wellman-Seaver-Morgan Co., of Cleveland, Ohio. The operation of this machine differs somewhat from other types of loaders, and certain distinct advantages are claimed. The shovel principle is eliminated; the material is not thrown onto the conveyor belt or into a car, but is first delivered to a hopper; the movement of the scoop is continuous, not reciprocating, and the loader and car remain stationary during the digging and filling operations.

As shown by the illustration, the machine consists of twin buckets operating on an endless chain, a hopper and a conveyor belt, which carries the ore to the receiving car. The scooping mechanism is so pivoted that it can dig to the side as well as in front of the machine, and the ore reaches the car, being delivered to the conveyor through the hopper, regardless of the angle at which the scoop is working.



THE McDERMOTT CONTINUOUS TWIN-SCOOP LOADER

The machine is self-propelled and of such dimensions that it may be easily transferred from place to place in the mine. The three main parts—truck, digging head, and conveyor—are dismountable and are readily reassembled, so that no trouble is encountered in transporting the loader through the shaft or from level to level. Adverse conditions and restricted space incident to underground mining have been kept in mind in the design of the McDermott loader, as it is compact, durable, and simple to operate.

The operating levers are placed at one side of the machine and in a position which enables the operator to have full view of the shovel movements. The loader is fitted with motors wound for 230 volts d.c., providing power for all of the operations. The motors are of the entirely closed type, and all chains and gears are protected with suitable guards. The entire framework is of steel; the digging head is mounted on a large ball bearing, and all parts are protected as much as possible against dirt and water. All chains are provided with take-up, and the digging edge of the bucket is fitted with renewable tooth sections. The general dimensions of the loader are as follows:

DIMENSIONS OF McDERMOTT CONTINUOUS TWIN-SCOOP LOADER

Maximum over-all length	15 ft., 9 in.
Maximum over-all height	5 ft., 6½ in.
Maximum over-all height (buckets in lowest position)	6 ft., 7½ in.
Maximum over-all width (machine in operation)	4 ft.
Gage of truck wheels	24 in.
Maximum rated capacity, with full buckets	1.75 tons per minute
Average capacity	45 tons per hour
Weight of complete machine	8,000 lb.

At the Caspian mine, Palatka, Mich., one of these shovels handled from 75 to 100 tons of iron ore, using three men, during a period ranging from two to four hours. In comparison with hand shoveling, it is stated that in similar ore, on a basis of one man shoveling 15 tons per day, the removal of an equivalent tonnage of ore would require the labor of six men for this total; a saving in labor of four and a half men's time.

*St. Francois, Missouri.

Correspondence and Discussion

Porphyry Intrusions of the Michigan Copper District

After reading Thomas S. Woods' article, "The Porphyry Instrusions of the Michigan Copper District," in the Feb. 15 issue of the *Journal*, I feel that I should state a few of my own observations on copper deposits, which have led me to draw somewhat different conclusions than those made by Mr. Wood.

The acid intrusive rocks, generally monzonites and monzonite porphyries, which are the mineralizers of most of the copper deposits in the United States and Mexico, are so characteristically marked by kaolinized feldspar and the development of sericite, due to the mineralizing solutions which they bear and the oxidization of the cupriferous pyrite, that it is impossible in most cases to get an unaltered piece of rock by means of which to identify the intrusives within considerable distance of any of these large copper deposits. On the contrary, the acid intrusive rocks of the Michigan copper district have an unaltered appearance, show good fresh phenocrysts of orthoclase and plagioclase feldspar, and I do not think that any trained observer, either miner, prospector, or geologist, would spend any time on the copper-bearing possibilities of the acid intrusive rocks of the Keweenaw Peninsula, although possibly the acid intrusives at the Indiana mine, which in places show a bleached kaolinized appearance, would indicate that they were a portion of a mineralizing magma.

The series of bedded basic flows and acid and basic conglomerates outcropping south of Lake Superior form the Lake Superior copper district, and they also outcrop north of Lake Superior and again in the Arctic Circle, where they have been explored on the Copper Mine River by men employed by one of the large copper companies. And it is interesting to note that in the Arctic Circle a period of sedimentation at the top of the series has laid down sandstones and shales similar to the Nonesuch formation. In all of these places the beds show some copper. Therefore, I conclude that the basic flows carried the copper and not the local acid intrusives of the Lake Superior copper district.

But I think that the heat given off by deep-seated portions of these barren acid intrusive rocks caused circulation of alkaline waters through the traps and assisted in deposition and concentration of copper in the porous amygdaloid tops of the flows and in some of the conglomerates, so that at present some of these porous channels are ore deposits. Most of the amygdaloid tops of the flows, though they are slightly copper-bearing, show that there has been intense circulation of waters and a deposition of numerous minerals, such as calcite, quartz, laumontite, prehnite, datolite, and zeolites. Again, there are amygdaloid tops from which these waters have been dammed off, leaving the amygdules empty of all minerals.

The fissures and faults in the Michigan copper district have occurred at possibly three different periods. The first series were the large slide strike faults occurring on the beds, and they follow the strike and dip. The second series were the faults that accompanied the intrusive acid magma and possibly had some bearing on the water courses, which redistributed the copper. The third series were post-mineral. Two large faults of this last series are noticed near the Portage Lake district, one just south of Houghton, and the other in the northern part of the town of Hancock, near the Quincy mine. The displacement of the latter fault was found by Marvin about 40 years ago, although he did not find the fault.

S. S. LANG.

Bessemer, Mich., Feb. 22, 1919.

Flotation Queries

I was much interested in the short article by Tom L. Gibson, of Grant, Colo., on p. 889 of the *Journal* of Nov. 16, 1918. It contains some timely questions on flotation. How many times in the last few months have I heard just such questions? From the viewpoint of a flotation operator a few more questions might not come amiss: Why is it that No. 7 is the best working cell in the mill? One also hears, "Your froth is fine, but I think you are using too much cake," or "No. 9 is dead; let's poke it up a little." Did you ever see the superintendent come down the stairs in the morning, smoking his cigarette, and say to the operator, "Your water level is too high in No. 3 and No. 5; better lower it a little"; and did you ever see him follow it up with a look at the valves to see that your air was all on? Did you ever see the manager throw out a bottle of 100/N acid because you were using too much lime? How closely can you gage your alkalinity by putting a drop, or two or three drops, of phenol into half a beaker of solution? Is it necessary to test the acidity of your ore after the flotation plant is once started? Did you ever work a shift with the mill superintendent, when he asked you to change some one of your conditions about every 15 minutes (results judged invariably entirely by the eye)?

In the wee small hours of the graveyard shift, when watching for the "beautiful bronze sheen" which sometimes overtakes your froth in floating copper ores, the following questions trouble me: Did you ever see a cyanide superintendent depend upon an ocular demonstration for the amount of his protective alkali? Are all flotation plants run somewhat loosely because they usually treat the base metals? Are not the flotation people depending too much upon the "ocular demonstration" for results? Could some of the refinements of the cyanide process be passed along to the flotation process with good results?

FLOTATION OPERATOR.

Ely, Nev., Feb. 5, 1919.

Empire Concentrating Table

In the Sept. 2, 1916, issue of the *Journal* there was an article by John Gross on the "Empire Long-Stroke Table." The information contained was interesting to operators and engineers, and I believe that they would be glad to know what progress has been made with the Empire table up to the present.

As is the case with most new ideas, the perfection of this table required considerable time and expense. A few mechanical difficulties and weaknesses developed in early operation, and because of the expense involved in the correction of these troubles, and for other reasons, it was decided to discontinue its manufacture. Since then, however, the mechanical difficulties referred to have been overcome.

The Empire table has a remarkable capacity, and, happily, it does not object to being crowded when occasion arises. The large capacity is due mainly to the long stroke imparted to the deck, and to a peculiar panning action that keeps the ore bed loose. The long stroke causes the deck to travel about twice the horizontal distance that other tables do; yet the reciprocating motion of the deck is easy, and greatly below the speed of other tables. From tests and observations it has been determined that the panning action of the deck is largely responsible for the high recoveries made with the Empire table and, to a less degree, for its capacity. The looseness of the ore bed permits of the easiest and quickest separation of mineral from gangue.

The Empire table is not made to handle slime. Its field lies in the concentration of ores that do not require crushing finer than 40 mesh, and it will handle any feed from this size to ¼ in. The St. Joseph Lead Co., of Bonne Terre, Mo., has been using the Empire concentrator for some time, with excellent results, as shown below.

OPERATION OF EMPIRE CONCENTRATING TABLE
Speed, 168 r.p.m.; Stroke, 3½ in.; Size of Feed, 2 mm.

	Tons	Pb Assay Per Cent.
Feed	50	9.78
Concentrates	5.5	78.5
Middlings	8.4	4.92
Tails	36.1	.48
Rejects	44.5	1.32

Inasmuch as the Empire table requires less floor space than many others, and can handle a large tonnage, give a high extraction, and produce high-grade concentrate, its adoption will, no doubt, steadily increase.

DONALD H. FAIRCHILD.

Foster Bldg., Denver, Colo., Jan. 20, 1919.

Ball Milling and Flotation

Frederick G. Moses has written an interesting and valuable paper entitled "Colloids and Flotation," which has been published by the Bureau of Mines as Technical Paper No. 200. Mr. Moses discusses many points in his paper worthy of further consideration. He does, however, make a statement with which I cannot agree. For instance, in speaking of the flotation experiments carried on at Inspiration, he writes as follows:

> Another discovery that was made at the mill of the Inspiration Copper Co. is of interest in this connection. It was found that better flotation results were obtained with pulp from the Marcy ball mills than with the same ore ground in pebble mills. Gahl has offered the explanation that iron from the iron balls used in grinding mills went into solution in the pulp and gave the right flotation conditions. This explanation seems reasonable, in view of the facts set forth herein, because the iron may have the effect of rectifying the surface-energy conditions necessary for good results, but another explanation could be offered.
>
> In order to get a clearer insight into the discussion that follows, a series of tests made in one of the well-known gravity concentrators may be mentioned. The company discovered that the pulp from a ball mill gave better results with a gravity concentration machine than when the ore was ground to the same fineness in other types of fine-grinding machines.
>
> As is well known, the pulp that is discharged from the trunnion of a center-discharge mill, such as the Hardinge, is classified before being discharged. Pulp of a certain density can support particles of not more than a certain maximum weight. The sulphides are heavier than the gangue, and must be more finely ground in order to be discharged from the mill. In the peripheral-discharge mill, the mineral particles are discharged regardless of their size. Hence, the sulphide particles in the pulp discharged from the Marcy mill at Inspiration were probably larger than those in the pebble-mill discharge.
>
> The relation of the size of sulphide particles to flotation results will now be discussed. As previously shown, for good flotation a certain relation must exist between the surface energy of the water, the oils, and the ore. As the surface energy of a substance is dependent on its surface tension and the amount of surface exposed, the amount of surface energy would be different for the same sulphides, depending on whether they had been crushed in a Marcy mill or in a pebble mill. Now, it would seem that the requisite conditions of surface energy for producing the most desirable surface-energy resultant would be when the particles are of the greatest size. This is more evidently true if one remembers that the best conditions for non-adsorption of the water by the sulphide is to have pure water and massive sulphide.

Although I agree with Mr. Moses that the sulphide particles from a grate type of mill are discharged regardless of size, on the other hand, this statement is only half the story: The ball mill in this case was not a *final* machine but was an *intermediate* machine.

When ore is ground in a closed circuit with a ball mill and a classifier, the size of the sulphide particles sent to the flotation machines is not determined so much by the type of mill employed as upon the classifying conditions under which the pulp has been classified. The governing factor as regards size of sulphide particles in ball-mill practice, in which a classifier is used, is determined by the *classifier* and *not by the type of ball mill.*

Evidently, then, Dr. Gahl's assumption that the iron balls exerted an influence on the flotation results is correct.

A. P. WATT.

New York, Feb. 14, 1919.

Graphite Industry in Alabama

In the article "Graphite Industry in Alabama" on page 306 of the Feb. 15 issue of the *Journal*, purporting to give the address of graphite companies operating in Alabama, the address of this company is given as Sylacauga, Ala. This is incorrect, the offices of this company, since its incorporation, having been in this city.

DURO-FLAKE GRAPHITE CO.,
P. S. Hay, Treasurer.

Montgomery, Ala., Feb. 25, 1919.

1918 Production of Carnotite

In regard to the article which I contributed to the Annual Review number of the *Journal*, I beg to advise that I was mistaken as to the 1918 production of carnotite. It seems that the information received from time to time during the last year in regard to the output of this ore was misleading. In reality, there was a total production of 8450 tons, averaging 2% uranium oxide and 3½ to 4% vanadium oxide.

Foote Mineral Co., H. C. MEYER.
Philadelphia, Penn., Feb. 20, 1919.

Post-War Readjustments in Collecting Mineral Statistics

WASHINGTON CORRESPONDENCE

Prior to the war, practically all statistics of domestic mineral production which were obtained by the U. S. Geological Survey were upon an annual or semi-annual basis, a frequency adequate in peace times, when industries changed only slowly under the operation of the law of supply and demand, but entirely inadequate for war times, when rapid developments and readjustments take place in many if not most of the important industries under the stimulus of greatly increased demands, the cutting off of imports to save shipping, and other causes.

During the war fuel statistics were collected by the Fuel Administration in coöperation with the Survey, and statistics for certain mineral derivatives were collected by the War Industries Board, but the Geological Survey remained the principal source of statistical information on mineral production.

To meet the needs of war administration, the statistics of production for most of the mineral substances of particular importance in the war situation were changed to a monthly instead of an annual basis; a few, such as copper, lead, zinc, and aluminum, were reported weekly, mainly for the guidance of Government purchasing agents. In many instances statistics of stocks and commitments were also added. This large increase of statistical work was accomplished without increased appropriations by diverting the time of geologists from more purely geologic work.

Most of the frequent statistics were for confidential Government use, but weekly spelter, quarterly manganese, monthly petroleum, and weekly coal and coke returns were made public, together with occasional reports on graphite, quicksilver, and magnesite.

It has been the belief of those in charge of this work that many of the country's mineral industries would benefit by more frequent and fuller statistical returns than were obtainable before the war, and the producers in certain industries have been asked to state their position in regard to the usefulness to them of more frequent statistics and their willingness to furnish them. The majority of quicksilver producers have expressed a preference for quarterly instead of annual statistics of production, and the quarterly basis will be maintained. Many of the smaller copper and lead producers desire the publication of monthly figures of production, but the large producers are almost without exception opposed to such publicity. Producers are generally opposed to publication of stocks in their hands or in transit, although some express a willingness to furnish such statistics if the Government also publishes stocks in the hands of consumers. The latter is a large statistical task.

A number of the larger producers of spelter have expressed their unwillingness to continue any longer the weekly reports of production and stocks that were made public throughout the war, so that during 1919 the spelter statistics will revert to the old annual basis. Statistics of coal and coke production will continue to be published weekly during the life of the Fuel Administration, but thereafter, unless the provisions of the Sundry Civil Bill as reported by the House are modified, they must return to the pre-war annual basis, a frequency wholly inadequate for an industry which lies at the foundation of the economic structure of the country. According to present plans, production statistics for other mineral commodities will be reported with the following frequency: Monthly statistics will be published for crude petroleum; quarterly statistics will be published for manganese ores, bauxite, and aluminum, but, for the latter, value only can be obtained. Semi-annual statistics will be published for nickel, tungsten, and molybdenum. Other commodities will be reported annually, as before the war.

Scope of War-Minerals Relief Narrowed

WASHINGTON CORRESPONDENCE

Manganese, chrome, pyrites, and tungsten are the only war minerals which may be made the basis of a claim against the Government under the provisions of the validation of contract law. Payments under the act must not exceed $8,500,000. With these important changes from the original proposition, the Senate and House each agreed without serious objection. The section of the law covering the war-minerals claims, which was drafted by Senator Henderson, of Nevada, and to which the conferees finally agreed, reads as follows in its entirety (The draft of this section reproduced on p. 370 of the *Journal* of Feb. 22 met with opposition after an agreement upon it had been reached by the conferees):

Sec. 5. That the Secretary of the Interior be, and he hereby is, authorized to adjust, liquidate, and pay such net losses as have been suffered by any person, firm, or corporation, by reason of producing or preparing to produce, either manganese, chrome, pyrites, or tungsten in compliance with the request or demand of the Department of the Interior, the War Industries Board, the War Trade Board, the Shipping Board, or the Emergency Fleet Corporation to supply the urgent needs of the nation in the prosecution of the war; said minerals being enumerated in the act of Congress approved Oct. 5, 1918, entitled "An act to provide further for the national security and defense by encouraging the production, conserving the supply, and controlling the distribution of those ores, metals, and minerals which have formerly been largely imported, or of which there is or may be an inadequate supply."

The said secretary shall make such adjustments and payments in each case as he shall determine to be just and equitable; that the decision of said secretary shall be conclusive and final, subject to the limitation hereinafter provided; that all payments and expenses incurred by said secretary, including personal services, traveling and subsistence expenses, supplies, postage, printing, and all other expenses incident to the proper prosecution of this work, both in the District of Columbia and elsewhere, as the Secretary of the Interior may deem essential and proper, shall be paid from the funds appropriated by the said act of Oct. 5, 1918, and that said funds and appropriations shall continue to be available for said purpose until such time as the said secretary shall have fully exercised the authority herein granted and performed and completed the duties hereby provided and imposed: Provided, however, That the payments and disbursements made under the provisions of this section for and in connection with the payments and settlements of the claims herein described, and the said expenses of administration shall in no event exceed the sum of $8,500,000: And provided further, That said secretary shall consider, approve, and dispose of only such claims as shall be made hereunder and filed with the Department of the Interior within three months from and after the approval of this act: And provided further, That no claim shall be allowed or paid by said secretary unless it shall appear to the satisfaction of the said secretary that the expenditures so made or obligations so incurred by the claimant were made in good faith for or upon property which contained either manganese, chrome, pyrites, or tungsten in sufficient quantities to be of commercial importance: And provided further, That no claims shall be paid unless it shall appear to the satisfaction of said secretary that moneys were invested or obliga-

tions were incurred subsequent to Apr. 6, 1917, and prior to Nov. 12, 1918, in a legitimate attempt to produce either manganese, chrome, pyrites, or tungsten for the needs of the nation for the prosecution of the war, and that no profits of any kind shall be included in the allowance of any of said claims, and that no investment for merely speculative purposes shall be recognized in any manner by said secretary: And provided further, That the settlement of any claim arising under the provisions of this section shall not bar the United States Government, through any of its duly authorized agencies, or any committee of Congress hereafter duly appointed, from the right of review of such settlement, nor the right to recover any money paid by the Government to any party under and by virtue of the provisions of this section, if the Government has been defrauded, and the right of recovery in all such cases shall extend to the executors, administrators, heirs, and assigns of any party.

That a report of all operations under this section, including receipts and disbursements, shall be made to Congress on or before the first Monday in December of each year.

That nothing in this section shall be construed to confer jurisdiction upon any court to entertain a suit against the United States: Provided further, That in determining the net losses of any claimant, the Secretary of the Interior shall, among other things, take into consideration and charge to the claimant the then market value of any ores or minerals on hand belonging to the claimant, and also the salvage or usable value of any machinery or other appliances which may be claimed was purchased to equip said mine for the purpose of complying with the request or demand of the agencies of the Government above mentioned in the manner aforesaid.

House Gets Complaint on Tin

WASHINGTON CORRESPONDENCE

A complaint, based on the action of the War Industries Board with regard to tin, has been brought to the attention of Congress by Representative Moore, of Pennsylvania. He was permitted to insert, as a part of the record of proceedings of the House, a letter on the subject written by William W. Justice, Jr., vice-president of the N. and G. Taylor Co., of Philadelphia. The letter is as follows:

The pig-tin committee of the War Industries Board arranged in an inter-Allied agreement for the purchase of a quota of pig tin for this country. All arrangements were distinctly a war measure, and a quantity of pig tin was bought, on the authority of the War Industries Board, for American consumers, and the medium through which this pig tin was brought to this country was the Steel Products Co. (the export end of the United States Steel Corporation).

We are led to believe that the questionnaire sent out by the War Industries Board, and the data secured by them, were neither complete nor thorough, and, based on certain incomplete figures which they procured, they proceeded to buy for this country from 10,000 to 12,000 tons of Straits pig tin at a Government cost to the consumer of 72½c. per lb. With the cessation of hostilities—in fact, prior to that—the open-market price of pig tin started to fall, and the present open-market price is something less than 54c., as against a Government monopoly price of 72½ cents.

The War Industries Board insists that the American consumers be forced to use this 72½c. pig tin, and consume the entire quantity before they will allow the American consumers to benefit by the open-market price of the world. In other words, the consumer has to carry the burden, and it is this very un-American plan of forced monopoly, insisted on by Mr. Armsby, that we wish to call to your attention as a serious menace to our industry.

We are asked to compete with the tin-plate markets of the world for export trade. The British manufacturers have access to lower costs of pig tin; the American manufacturer has not. When pig tin was being bought at 72½c. the fixed price of finished tin plate was $7.75. The Government insists on holding up the cost of the raw material to 72½c., and has allowed the price of the finished tin plate to go to $7.35.

We believe that the purchase of these 10,000 tons of pig tin through the United States Steel Products Co. should be looked on as a war measure. No longer is need evident for tin regulation, and the sooner a free market is established the better. The logical solution is to let down at once the bars on imports. The loss incurred on the tin now held by the Steel Products Co. should be charged to profit and loss account of the war, and not be borne as a burden by the American manufacturer.

No redress is seemingly to be secured through the War Industries Board, which naturally is loath to go to Congress and ask for the assumption on the part of the Government of the four or five million dollars represented by the difference between the cost of the pig tin that it bought and the present market. We have had letters from a number of tin-plate manufacturers agreeing with our position, and we urge you to give your attention to this situation, which has been given considerable publicity in the trade papers.

The injustice of the situation is so apparent that we beg your careful consideration and action.

Salvage of Machinery

We are glad to give immediate publicity, as requested, to the matter dealt with in the following communication:

UNITED STATES SHIPPING BOARD
EMERGENCY FLEET CORPORATION

Philadelphia, Penn.
February 12, 1919.

Mr. Bradley Stoughton,
Secretary, American Institute of Mining Engineers,
29 West 39th St., New York City.

My dear Mr. Stoughton:

I hope to be able personally to be in New York some time during the meeting next week of the Institute, and to bring before some of the engineers a matter in which I believe they might be of considerable assistance both to the United States and to the mining and metallurgical companies with which they are connected. In case, however, I am unable to be present, I am going to ask you to call to the attention of those interested the fact that the Government has, through the Emergency Fleet Corporation, a very large quantity of machinery of a most varied character for salvage. The greater part of this equipment is new (such as machine tools of all kinds, pumps, cranes, electrical equipment, air compressors, piping, and similar material), and there is also a quantity of shipyard material which for some time will be increasing, the greater part of which has been used during the past two years. The disposal of this material is, of course, a serious problem for the Emergency Fleet Corporation, and it is desired to accomplish it in such a way that the Government's interests will be protected so far as possible, and also with due regard to the market conditions in the various lines of manufacture involved.

It is naturally desired to move as great an amount as possible of this excess material to foreign countries; and mining engineers, therefore, who have foreign connections, might well be advised of the situation. The greater part of the excess material can be made ready for exceedingly prompt shipment from warehouses widely scattered throughout the country.

Although it is not the policy of the Fleet Corporation to make an undue sacrifice in the matter of price, particularly on new machinery, it is the desire of the Corporation to liquidate its holdings in excess material in as reasonable a time as possible; and I think it would, therefore, be to the distinct interest of purchasers of equipment to make it a practice to first inquire if the material desired is available in any of the warehouses of the Emergency Fleet Corporation before placing orders through ordinary channels. The more quickly the market can be relieved of this material, the sooner will normal conditions return, and I feel that the interest of the Government, the manufacturer and consumer, will all best be served by engaging in a coöperative way to absorb this property.

Mr. G. Woolfolk, late in charge of various activities of the War Industries Board, is to handle the salvage end of the Emergency Fleet Corporation, and to him, at 140 North Broad St., Philadelphia, Penn., all inquiries should be addressed.

I would appreciate it very much if you would call this matter to the attention of the engineers when some convenient opportunity presents itself.

Yours very truly,
W. MURRAY SANDERS,
Acting manager, Division of Cancellations, Adjustments and Salvage.

Objection by Senator Walsh, of Montana, lost to the Henderson potash bill the only opportunity it had of being considered in the Senate. Even had the matter been permitted to come up for discussion, it is believed that its chance to pass would have been small. The consumers of potash, who include farmers, are understood to be a unit against restricting the free importation of foreign potash.

February Mining Dividends

Dividends paid in February, 1919, by 18 United States mining and metallurgical companies making public reports amount to $8,088,946, as compared with $12,577,611 paid by 21 similar companies in February, 1918. Canadian and Mexican mining companies paid $1,568,500 in February, 1919, as against $1,606,497 in 1918. The only holding company which paid in February was the White Knob Copper and Development Co., which disbursed $10,000, or 5c. a share.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Zinc, Lead & Sm., pfd	U. S.	$1.50	120,810
Anaconda, c. s. z	Mont.	1.50	3,496,875
Barnes King, c.g	Mont.	.10	40,000
Caledonia, l.s	Ida.	.01	26,050
Chief Cons., l.s	Utah	.12½	110,528
Cresson Cons., g	Colo.	.10	122,000
First Nat. Cop	Calif.	.15	90,000
Golden Cycle, g	Colo.	.03	45,000
Homestake, g	S. D.	.50	125,580
Internat. Nickel, pfd	U. S.-Can.	1.50	133,689
Iron Cap, c	Ariz.	.25	36,225
Miami, c	Ariz.	1.00	747,114
Mohawk, c	Mich.	2.00	200,000
New Jersey Zinc	U. S.	4.00	1,400,000
United Eastern, g	Ariz.	.05	68,150
United Verde, c	Ariz.	1.50	450,000
United Verde Ex., c	Ariz.	.75	787,500
West End Cons., g.s	Nev.	.05	89,425
Canadian and Mexican Companies	**Situation**	**Per Share**	**Total**
Amparo, g.s	Mex.	$0.04	80,000
Coniagas, s	Ont.	.25	100,000
Granby Cons., c	B. C.	2.50	375,000
Greene Cananea, c	Mex.	1.50	750,000
Hollinger, g.s	Ont.	.05	246,000
Rambler-Cariboo, l.z	B. C.	.01	17,500

Total dividends in the first two months of the year were as follows, the figures for 1918 being given in parentheses: United States mining and metallurgical companies $17,383,568 ($20,021,013); holding companies $330,000 ($330,000); Canadian, Mexican and Central American companies, $3,149,572 ($4,036,627).

Chronology of Mining, February, 1919

Feb. 1—Fire broke out in Belgrade mine of Pickands, Mather & Co. at Biwabik, Minn., one miner being suffocated.—Ore-storage warehouse opened at Picher, Okla., by Tri-State Operators' Association.

Feb. 3—Conference begun on Jan. 31 between copper company employees and Secretary of Labor terminated in Washington.—Steel plant of Nova Scotia Steel and Coal Co. shut down temporarily.

Feb. 4—Application of Butte & Superior company for modification of injunction in Minerals Separation case denied by U. S. District Judge G. M. Bourquin at Helena, Mont., leaving status of case unchanged pending decision of U. S. Supreme Court.—Bounty on Canadian iron ore advocated to Canadian government at Ottawa by deputation from various northern Ontario districts.—Temiskaming shareholders agree on purchase of Dolly Varden and Wolf silver mines, in British Columbia.

Feb. 6—Wage reduction at Great Falls and Anaconda smelteries ordered by Anaconda Copper Mining Co.

Feb. 7—Strike ordered in Butte district by I. W. W.—Utah Copper Co. reduces wages of miners and millmen approximately 75c. per day.—Consolidation announced of controlling interests in Rochester Mines and other Rochester, Nev., companies, eliminating pending litigation between Rochester Mines and Rochester Elda Fina.—Sixth annual meeting at Butte of Montana section of American Institute of Mining Engineers.

Feb. 8—Clark and Sultana mines at Ironton, Minn., closed down.

Feb. 10—Strike declared at Jerome, Ariz., when copper companies reduced wages 75c. per day.—Wages reduced in Clifton-Morenci-Metcalf district of Arizona.—East Butte smeltery at Butte, Mont., shut down.—Joint meeting of Founder Societies in Engineering Societies Bldg.. in New York.

Feb. 11—Report on gold situation submitted to Secretary of Treasury by committee appointed on Nov. 2.—Anaconda concentrator closed, owing to Butte strike.—United Verde and United Verde Extension companies issue joint ultimatum warning striking employees to return under penalty of indefinite shutdown.—Smelteries in Salt Lake Valley, Utah, reduce wages 65 to 75c. per day.—Annual meeting of Idaho Mining Association begun at Boise.

Feb. 12—Anaconda acid plant closed, owing to Butte strike.

Feb. 13—Hearing of potash producers begun before Senate Committee on Mines and Mining.

Feb. 14—Mines and smelteries of Verde district, Arizona, closed down upon failure of men to report for work. Cuyuna Mille Lac mine, at Ironton, Minn., closed.

Feb. 17—Butte strike called off after men have been out nine days.—First locomotive fired on Montana Southern Ry. of Boston & Montana Development Co.—Annual meeting of American Institute of Mining Engineers begun in New York.

Feb. 18—Meetings held in Pittsburgh by Associated Manufacturers of Merchant Pig Iron and by American Pig Iron Association.

Feb. 28—Trustees' sale of plant and mines of U. S. Manganese Corporation at Harrisonburg, Virginia.—Validation of contracts bill signed by President.

Mining Regiment Sails for Home

After several delays and consequent disappointments the 27th Engineers sailed from St. Nazaire late on Mar. 4 on the S. S. "Dakotah," with the expectation of reaching New York about Mar. 16. A cablegram to this effect was received from Colonel Perry on the day of sailing, so the regiment's arrival is now confidently awaited.

As the 27th nears home, it is gratifying to note that the Comfort Fund has practically attained its goal of $20,000, the total receipts to date falling short of that amount by only a few dollars. There will be ample need for the balance on hand, as in addition to providing a welcome for the returning men, there will doubtless be many expenditures for incidentals between now and the time when the regiment is mustered out.

HOW THE COMFORT FUND STANDS

Receipts to Jan. 1, 1919, including interest	$19,745.21
Alaska Mining and Engineering Society	111.00
W. H. Corbould	6.50
Dover Laboratory	2.00
W. L. Strauss	10.00
Employees Braden Copper Co., Chile	34.00
W. C. J. Bartels	20.00
January interest	15.75
H. V. Maxwell	5.00
Leonard Loehr	5.00
Carl J. Trauerman (second contribution)	5.00
Carl Tombo	6.00
Charles Le Vasseur (monthly)	5.00
February interest	16.44
D. W. Hall	10.00
Total	$19,996.90

Checks should be made payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

Editorials

The 27th Engineers sailed from St. Nazaire for New York on Mar. 4, and will probably arrive here about Mar. 16. There will be a lot of good mining engineers and miners who will soon be wanting jobs. We hope that all of our friends, and their friends, will immediately give consideration to this important matter.

The Lead Producers' Committee

THE Lead Producers' Committee for War Service has published a pamphlet, giving a brief history of the activities of the several organizations that were formed by the lead producers of the United States, both to aid the Government in its purchases of pig lead and, later, to take charge of the distribution of the supply, this historical sketch having been prepared at the request of the historical branch of the General Staff of the War Department. Prepared by Arthur K. Mitchell, secretary of the committee, it gives a concise and accurate account of what was done by the lead producers, beginning with April, 1917, and ending with December, 1918. It makes a very gratifying record.

This was a case in which the whole business was left to the producers themselves. There was neither Government regulation nor official price-fixing. The entire expense of the work was borne by the producers. They secured for the Government its supply of lead on very economical terms. On numerous occasions the producers generously sacrificed themselves in the interest of the Government. Whenever an agreement conditional upon future conditions had been drawn, the producers lived up to it so long as it was in favor of the Government, but if it turned in favor of themselves they waived their rights. With the Government it was a case of "heads I win, tails you lose."

With this generous and excellent management, so much of which was due to the intelligent leadership of Clinton H. Crane, president of the St. Joseph Lead Co., the lead producers had the satisfaction of seeing their industry enter into the chaotic post-war period in a far better condition than any other of the major metal industries. The history of the lead industry during the war will always be a shining example of the advantage of trusting to the patriotism of people, even if they be interested, and letting the men of an industry do the things that they, best of all, know how to do.

American Mining Congress

THE American Mining Congress was organized in Denver in 1896 for the purpose of securing Federal aid for the mining industry through the creation of a Department of Mines with a member of the President's Cabinet for its head. That aim has not been attained, and the question might well be asked, "Have the results which it has accomplished been worth the efforts expended?"

A complete answer to the question would be a recitation of its activities and a biography of J. F. Callbreath, who has been its secretary, its heart and soul, ever since its organization. Did space permit, it would be our pleasure to print in full Mr. Callbreath's address before the California chapter of the congress at its organization on Jan. 15, 1919, in which he followed the history of the organization from 1896 to the present. In a short editorial we can do justice to neither Mr. Callbreath nor the organization, but in passing we cannot refrain from pointing to a few of those activities that have had a material influence upon the industry.

The conception of a Department of Mines did not meet with sufficient support to carry it through, but a few years later a Bureau of Mines was suggested. At first this met with scant support, and when, finally, a bill authorizing it did pass Congress, it was necessary to redouble efforts in order that this bureau might be of benefit to Western mines.

Congress has continued to support the Bureau of Mines in its ever-widening field of activities, and is responsible to no small extent for the benefits which that Bureau has extended to the mining industry. This organization has always opposed the action of the Federal Government in exercising control over water powers and mineral rights within the several states and territories, claiming that, with the formation of the state government, Federal control should cease. Failing to convince the East of the justice of the attitude of the West, it has fought valiantly for provisions in the leasing bills that would make it possible to develop the resources of the West, and it now points with some justice to the coal situation on the Pacific Coast, where, with quantities of good coal near tidewater in Alaska, none is available for Pacific Coast cities.

Ever since 1913, when an income-tax bill was before Congress, the American Mining Congress has taken an active part in an endeavor to see that mines were taxed no more than their just proportion. Our legislators refused for a long time to recognize the fact that the receipts of a mine, less expenses, did not equal income. They refused to acknowledge that a mine was a wasting asset, and that income was not always income. This is not now the case, and it is not so, largely because of the incessant efforts of Mr. Callbreath and his associates to show legislators the justice of their contention. Not only in this particular, but in the making of later laws and interpretations, have the members of the Mining Congress performed notable service in guiding the work of committees and the decisions of the department.

In reference to the war-minerals relief measures, the Mining Congress has taken a strong stand in behalf of those who have lost money through their efforts to mine certain minerals the production of which was represented by Government authorities as essential to our winning of the war.

The latest plan of the Mining Congress proposes to increase its influence by dividing its work into eight subdivisions, each to be in charge of a specialist familiar with the ores or minerals coming particularly under his supervision. It is hoped that, with each branch of the industry in the care of one who knows it thoroughly, all branches of mining may coöperate to advantage when any one particular industry needs Federal aid. The financing of the congress for this purpose is a rather formidable undertaking, but Mr. Callbreath enjoys difficult situations, and, if the idea receives any appreciable support from the industries affected, he will carry it through.

Standardization of Salaries

ONE of the difficulties early encountered by the U. S. Railroad Administration was that presented by the wide variation in the salaries of the various technical engineers in its employment. The Board of Wages and Working Conditions undertook the task of classifying these engineers and fixing their salaries, but gave it up as a bad job. Finally the problem of grading the engineer employees of the railroads was taken up by the American Association of Engineers, and that body succeeded in evolving a fairly consistent schedule, which has been recommended to the administration.

The duties and responsibilities of the higher officials vary so much that nothing was attempted where the services rendered were worth more than $5000 per annum. In the case of lower-salaried men—and these make up the greater portion of the engineering staff—the committee chose a title, then stipulated the nature of the work performed under that title, and suggested a suitable salary. Whether the particular salaries are proper today, or would be at some other time, is a matter of no great moment. The important point is that the committee arrived at a comparative value of the services performed, and classified the men accordingly.

This regulation of salaries brings up the suggestion that each one of the engineering societies should fix or standardize the salaries of its own members. Is such a thing possible or desirable?

There is something abhorrent to the technical graduate in the idea of a union that has for its main object, or even for one of its objects, the fixing or maintenance of wages. It is inconsistent with the popular idea of "every one for himself, and the devil take the hindmost," or, to put it in less homely terms, it is inconsistent with the American idea of independence. Every graduate knows when he comes out of college that he will be valued at little more and receive little more than a common laborer, but he also knows, or thinks, that there is no technical position in his chosen field to which he may not attain if he works hard and honestly.

A union or association of junior engineers might be formed and might be of material assistance to the younger members of the profession in standardizing their salaries. That such a protective organization has never been formed may be due to the lack of its need, or, possibly, to the inability of those who do need it most to form such an association. The better men, the men who make such a thing a success, advance step by step, and are soon out of the class needing help. Such men would have little more than an academic interest in the association that rendered them little assistance on their way up.

It is doubtful if engineers are yet ready to undertake the standardization of their own pay and employment; though, as a matter of good business management, it may be done for them in the case of large organizations employing many engineers. On the other hand, when a young man has worked night and day for years to put himself through college, it is with some irony that he reads the advertisements under "Position Vacant." The first one may indicate that rock-drill men are wanted at $5.50 per eight-hour shift. The second advertisement may call for an assayer and chemist—one who is familiar with cyanidation and flotation, can make accurate surveys, and understands mine bookkeeping—at a salary of $100 per month at the start. That means $4 per day for a 14-hour day, and seven days a week. The beginner, at this juncture, may well conclude that there ought to be a union among mining engineers, a union that would see to it that brains were paid at least as much as brawn. And it does seem unfair that acquisition of a college education should place a man at a financial disadvantage as compared with one who has had a few months' training at some purely mechanical operation.

If these two jobs were to be permanent—if the work and the compensation in both were to remain indefinitely the same—there would be a real need of protecting the numerically smaller class. But they do not remain the same. The miner will hardly get more, war times excepted, and the six-hour day is not yet in sight; but the assayer-chemist-surveyor-bookkeeper has something to work forward to. He may get into the mine; he may become a shift boss, a foreman, a superintendent, or, finally, manager of the property, and he retains his small salary only so long as that is the limit of his capacity.

One practical difficulty in the standardization of salaries for a group in a profession is that brains cannot be standardized, or, rather, they will not remain standardized. If they are only equal to a certain quantity of work, something that can be definitely measured, then a rate of pay can be apportioned, but a real live brain is constantly growing and expanding by imperceptible degrees, making itself more useful, though its daily task may not have changed.

Though standard compensation is possible, reasonable, and advisable in the junior technical staff of a large organization, such as that of a railway company, it is difficult to demonstrate that it would be practicable or of sufficient benefit to attempt it for any branch of the engineering profession as a whole.

The passage of the bills in Congress for release of the wheat market and the validation of war contracts, and the gradual crumbling away of the prices for iron and steel, are encouraging with regard to the readjustment of industrial conditions. The enlightened policy of the Army officials in putting the Government's stocks of copper in the hands of the producers for gradual liquidation is another good feature. One of the best

things of all, however, was the firm and finely American stand of Ole Hansen in Seattle, who posted a plain signboard pointing the road that leads away from dissension and discord.

The Index for Vol. 106 of the *Journal* is now ready for distribution and will be mailed only to those who request it. Those who wish a copy of the Index, are requested to send for it promptly. A postcard will do.

BY THE WAY

"I have discovered a device, which I keep secret, by which I can locate the main gas strata underground," wrote the "discoverer" to the U. S. Bureau of Mines last year. "I am not financially fixed to carry the plans out very rapidly, but I managed to drill several wells with success in a new field. If I can get a chance to help the Government in this war, I will ask only a reasonable salary and expenses. I can detect these gas belts riding in an automobile or some other way as long as I can get over the field. In that way it doesn't take me long to get over the ground. I don't think any geologist can locate gas strata in a prairie or green field and tell whether he is over an oil belt or gas alone, but I claim I can."

The movement to compensate industrial accidents without suits to prove negligence of the employer is one of the most striking in the field of labor legislation in recent years. From indifference and even hostility hardly more than a decade ago, the principle has obtained acceptance in all but 10 states of the Union; and the day seems not far distant when the obsolete system of damage suits and charges and counter charges of negligence and contributory negligence will no longer be used in the disposition of industrial injury claims. The subject is brought up to date in Bulletin 243 of the U. S. Bureau of Labor Statistics, which supplements earlier publications and presents the action of the courts and legislatures during the years 1917 and 1918. Five new states came into the compensation fold in 1917 and one state was added in 1918, and amending and supplemental laws were enacted in more than 30 jurisdictions.

The old-style type of prospector yielded results, partly due to the fact that there were so many of him. Watch the scout patrols of some colony of ants, and you will observe many of them wandering around as if demented. But as soon as one makes a strike, the news spreads rapidly, and traffic is organized along certain routes, while vague and random prospecting still continues in the vicinity of the "famous mines" of sugar, rice, or whatever chances to be the temporary boom. Frequently the ant gets results simply because instinct governs, rather than orthodox theories as to the genesis of sugar deposits. The adherence to orthodox beliefs limits the field of the scientific prospector. A belief in the persistence of orthodoxy may even prove disastrous, as shown by an old yarn published in *Galaxy* of April, 1872. Two prospectors in the Reese River country, in Nevada, had just bought a ham, regardless of high prices. They boiled it and ate sparingly, it being doubtful if more could be purchased. When a Jewish neighbor came to call, however, they felt perfectly safe in inviting him to dinner. To their consternation, the ham began to disappear at an alarming rate. In a diplomatic way one partner in the grubstake brought up the subject of the Mosaic prohibition of swine's flesh. "Oi, Oi," said the guest, cutting off another chunk of ham, "Ven Moses wrote dot, he had a bunch of sheeps for sale, yet."

There has been more or less speculation (mental speculation) during recent years as to whether the prospector, now rare, will finally become extinct. He will, if the people with the coin decline to take any risks and the people with goods and scientific ability refuse to barter. But it is expecting too much to ask that the engineers and assayers should be the sole encouragers. An illustration of the old-time mining life is afforded by the story of E. C. Bassick and his experience in the little camp of Rosita, Colo. In earlier days Bassick had hunted for gold in Australia, finding little wealth and losing his health. In 1877 he was literally "bumming" his way around Rosita, prospecting in a dreamy, luckless way. One day he sat on the ground, doubtless cussing his luck, pounding aimlessly on a boulder that hundreds of experts had passed by with disdain. A chip of the boulder aroused his curiosity; and, with a handful of specimens, he hunted around for some person with money and good nature. Picking out the most promising individual, he offered a half interest (fifty-fifty, no less) for the sum of $25. Nothing doing. Somewhat discouraged, he trudged along and happened to see a load of cordwood being unloaded at the door of an assayer's shack. So Bassick hustled, made a bargain with the assayer, sawed the wood, had his specimens assayed, and thus obtained a means of strengthening his position in a financial deal. Within three years he had taken out of his mine about $450,000 and then sold it for $300,000 cash and $1,000,000 in stock.

The 'Andy Man

BY D. E. CHARLTON

W'en there's a bit o' fixin' to be done abaout tha mine.
Repairin' to tha 'eadframe, pump or skip,
If tha job be temporary, I tell 'e this, m' son,
Thee can do it diffren' ways, but 'ere's a tip:

There's lots o' these 'ere shortcuts, an' tha chap 'oo turns
'is 'ead
To little things that's needed naow an' then,
'E will fin' 'imself a-thinkin' tha bes' way 'e can do
Tha fixing', an' 'e naws jus' 'ow an' w'en.

To keep tha w'eels a-gawin' sometimes takes a lot o' grit,
There's times a chap may 'ardly think it's worth
Tha trouble, fuss an' bother, but 'e'll stick through to tha
h'end.
Min' you, 'e's tha chap we calls tha "salt o' h'earth."

'E may be in tha pump'ouse with a bit o' bloody pipe
A-tryin' some device to make tha h'air
'It tha drill bit all tha 'arder—depen' on it, m' son,
W'en 'e's through 'e naws 'e's done a job that's fair.

Thee may fin' 'im in a drif' h'end, 'is foot propped on a stull,
A-thinkin' h'up a way to 'old tha back,
That requires diffren' treatment. But 'e's it figgered h'out,
An' tha bloody thing will stan' without a crack.

'E ain't got no h'occupation as far as titles gaw,
But 'e's jus' w'ere you want 'im all tha time,
An' any job that mus' be done from dry room down to sump,
'E's tha 'andy man, as nawn, at ev'ry mine.

Personals

Have You Contributed to the Association of the 27th Engineers?

G. A. St. Clair, president of the Section Thirty Mining Co., of Minnesota, is in Florida.

Errol MacBoyle, of San Francisco, announces the removal of his offices from the Crocker Building to the Hobart Building.

Edward S. Davis, chief of the Fuel Oil Section, Bureau of Oil Conservation, after six months of service, has returned to Tate, Jones & Co., Inc., Pittsburgh.

Francis J. Webb, general manager of the Minnesota and Michigan properties of the Republic Iron and Steel Co., has returned from a visit to the main offices of the company at Youngstown, Ohio.

J. W. Pearce has assumed his duties with the engineering department of the Inspiration Consolidated Copper Co. at Miami, Ariz. Mail address is Box 131, Inspiration, Arizona.

W. W. Coleman, president of the Bucyrus Co., South Milwaukee, will be a delegate of the Milwaukee Association of Commerce to the National Foreign Trade Convention to be held in Chicago on Apr. 24 to 26.

Louis A. Wright expects to sail from Chile for New York about Apr. 1, hopes to arrive here soon after the middle of April, and plans to make a long stay in this country. His address will be 61 Broadway, New York.

Bulkeley Wells has been elected president of the Gold Point Consolidated Mines, Inc., recently organized to take over the Eureka-Idaho-Maryland, Gold Point, Union Hill, South Idaho, and other properties near Grass Valley, California.

H. G. Turner, South American representative of the Denver Rock Drill Co., has arrived in Lima, Peru, from Colorado, where he formerly was connected with the Sunnyside Mining and Milling Co. He will make his headquarters in this city.

H. C. Dudley returned from France in January. He served as captain in the 36th Engineers at Gieveres, and was transferred at the beginning of September to the department of the chief engineer, First Army. Mr. Dudley has moved his office to 704 Lonsdale Bldg., Duluth.

Hoyt S. Gale, geologist of the U. S. Geological Survey, is en route to Europe as a member of a commission sent by Secretary Lane to study reconstruction problems. Mr. Gale's special mission is the investigation of potash supplies available for the United States, and he will visit deposits in Alsace, Spain, and elsewhere.

Major Carl Stevenson, recently released from the gas and flame division of the U. S. Army, has returned to work in the engineering department of the Cleveland Cliffs Iron Co.'s Mesabi Range properties. Major Stevenson, prior to his enlistment, was head of the company's "Safety First" department and had also been connected with the educational department.

Capt. Percy E. Barbour has forwarded his resignation as Deputy Superintendent of the New York State police to Major George F. Chandler, in command. Captain Barbour has been attached to the Engineer Corps, U. S. Army, for the last six months under a leave of absence. He will become Assistant Secretary of the American Institute of Mining and Metallurgical Engineers.

Herbert C. Hoover, who was recently named Director General of Allied Relief, under the commission sitting in Paris, has been appointed by President Wilson to be Director General of the American Relief Administration, with full authority to supervise the expenditure of $100,000,000 recently voted by Congress for European famine relief. **Edgar Rickard** and **Theodore F. Whitman,** who have been directing the affairs of the Food Administration during Mr. Hoover's absence in Europe, have been appointed by the President to be joint directors, in the United States, of the newly created relief administration.

Obituary

Herbert R. Dryfoos, president of the Cleveland Alloys Co., Cleveland, died on Feb. 18 of pneumonia at his home.

W. S. Henry formerly of the Backus & Johnston company at Casapalca, Peru, died recently from acute influenza in New York. Mr. Henry came to the United States intending to enlist in some branch of the service.

Norman M. Thornton, of Edmonton, Alta., died on Feb. 23 at the age of 38. He was recently in charge of the Mountain Park Collieries, in the development of which he had taken an active part. He leaves a widow and one child.

James Stobie, one of the early prospectors in Ontario, died recently at Ypsilanti, Mich. He was the first to find nickel ore in the Sudbury district, and discovered the Mount Nickel and Stobie mines. He acquired considerable wealth through his discoveries and contributed largely to religious objects. Mr. Stobie was engaged in farming during the latter part of his life.

T. Walter Beam died at his home in Denver on Feb. 1, after a short illness. He was born in Bellaire, Ohio, in 1854, and since 1871 had been engaged in mining in Colorado and elsewhere. He was one of the locators of the Japan mine, in Savage Basin, near Telluride, Colo., and was interested in the famous Eureka mine, at Sutter Creek, Calif., and the Nickel Plate property, at Hedley, British Columbia. He is survived by his widow, daughter and son.

George B. Sheldon, director of the American Locomotive Co. and of the Bethlehem Steel Co., died on Jan. 14, at Carbondale, Ill., from injuries received while inspecting a coal mine at that place. He was 62 years old. Mr. Sheldon was also president of the Electric Securities Co., treasurer of the Milwaukee Electric Ry. and Light Co., treasurer and director of the Detroit Edison Co., director of the Mechanics & Metals National Bank, the Union Electric Light Co., of St. Louis, the Cincinnati Northern Railway Co., the West Kentucky Coal Co., and the Wisconsin Edison Co.

Societies

International Mining Convention will be held in Vancouver, B. C., Canada, Mar. 17-19. Frank Probert, dean of the College of Mines of the University of California, who is now abroad, is expected to be one of the speakers. Burr Evans, of Placerville, Calif., will also address the convention.

American Society of Mechanical Engineers, New York section, held a meeting at the Engineering Societies Building, 29 West 39th St., on Feb. 24. Subjects of the evening were "The Application of Electrical Control to Gate Valves," illustrated by lantern slides, by Peter P. Dean, and "The Application to Industry of the Personnel Work in the U. S. Army," by Lieut.-Col. J. J. Swan.

Engineers' Club of Philadelphia will hold a special meeting on Apr. 23, when Arthur J. Baldwin, vice-president of the McGraw-Hill Co., of New York, will present an illustrated paper on "The Devastated Area and Its Reconstruction." The regular meeting will be held on Mar. 18, at Witherspoon Hall, and will be addressed by Dr. John A. Brashear, former president of the American Society of Mechanical Engineers.

American Association of Petroleum Geologists will hold the fourth annual meeting on Mar. 13 to 15 at Dallas, Tex. Registration of members will begin on Mar. 13 at 9 a. m. in the Adolphus Hotel, and will be followed by an address of welcome by Mayor Lawther of Dallas, and other short addresses by Mark L. Requa, of the U. S. Food Administration; David White, chief geologist of the U. S. Geology Survey; I. C. White, state geologist of West Virginia; Ralph Arnold, chief of valuation section, Internal Revenue Department, U. S. Treasury; Beeby Thompson, consulting petroleum geologist, London, England; Professor Salisbury, University of Chicago; J. A. Udden, state geologist of Texas, and others to be announced later. All petroleum geologists and engineers are invited to be present at the technical sessions. Among the many papers to be presented at the technical sessions will be the following: "Relation of Surface Structures to the Occurrence of Oil in North Texas," by Wallace E. Pratt; "The Stratigraphy of Pennsylvania Formations of North Central Texas," by F. B. Plummer; "Factors in the Valuation of Oil Lands," by Carl H. Beall; "Laboratory Methods for the Examination of Well Cuttings," by E. A. Trager; "Relations of Sulphur and Cap Rock in the Coast Domes," by C. R. Eckes. Further information can be secured by addressing W. E. Wrather, secretary, 6044 Bryan Parkway, Dallas, Texas.

Industrial News

Brown-Steel Co., Columbus, Ohio, has been incorporated to take over the steel department of the Columbus Mill and Mine Supply Co. of that city.

Chicago Pneumatic Tool Co. announces the removal of its Cleveland district office from Room 813 to Rooms 406-408 Engineers' Bldg., Cleveland. Ross Watson is district manager.

W. A. Butchart, Denver, Colo., manufacturer of concentration apparatus, has recently purchased the complete plant and equipment of the Enterprise Machine Co. The offices will be consolidated, and the business conducted hereafter at No. 1326-1330 Eleventh St. The former address was 605-607 Mercantile Building.

Beckwith Machinery Co., Arch St. and Parkway, Northside, Pittsburgh, has opened an office and warehouse at 1227 West 9th St., Cleveland, for the sale of the regular lines of mine, mill and construction equipment marketed by this company. The Cleveland office is in charge of E. D. Stoner, assisted by C. S. Dally.

Wellman, Seaver, Morgan Co., Cleveland, Ohio, at the annual stockholders' meeting in Cleveland, on Feb. 18, reëlected the retiring board of directors. At the directors' meeting the following officers were elected: Edwin S. Church, president and general manager; S. H. Pitkin, vice-president; George W. Burrell, second vice-president; W. H. Cowell, secretary and treasurer. The Cleveland and Akron works will be in charge of the second vice-president.

Pulverized Fuel Equipment Corporation, with offices at 30 Church St., New York, and in the Transportation Bldg., Montreal, Canada, has recently been organized to take over the business of the Locomotive Pulverized Fuel Co. to extend the business of the latter to cover the general industrial field, particularly metallurgical and central-power station installations. The officers of the new corporation will be: H. F. Ball, vice-president, executive; H. D. Savage, vice-president in charge of sales; V. Z. Caracristi, vice-president in charge of engineering; Samuel G. Allen, secretary-treasurer.

New Patents

United States patent specifications may be obtained from the "Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Furnace, Melting and Pouring. Ignac Kormutt, Charleroi, Penn. (U. S. No. 1,290,242; Jan. 7, 1919.)

Furnace, Metal Heating. Walter S. Rockwell, New York, N. Y., assignor to W. S. Rockwell Co., New York, N. Y. (U. S. No. 1,289,547; Dec. 31, 1918.)

Furnace, Oil. John W. Lewellen, Ridal, Penn. (U. S. No. 1,289,484; Dec. 31, 1918.)

Furnace, Tungsten-Reducing. Carl A. Pfanstiehl, Waukegan, Ill., assignor to Pfanstiehl Company, Inc., North Chicago, Ill. (U. S. No. 1,289,896; Dec. 31, 1918.)

Gold Dredge Tumbler. George E. Sibbett, Berkeley, Calif. (U. S. No. 1,289,561; Dec. 31, 1918.)

Ingot Charging Into Ovens, Apparatus for. Ernest Fuchs, Billancourt, France, assignor to Louis Renault, Billancourt, France. (U. S. No. 1,290,163; Jan. 7, 1919.)

Ingot Mold. William G. Mathias, Ensley, Ala. (U. S. No. 1,290,627; Jan. 7, 1919.)

Iron and Steel, Rust-Proofing Coating. William H. Allen, Detroit, Mich. (U. S. No. 1,290,476; Jan. 7, 1919.)

Kiln. John B. Owens, Metuchen, N. J. (U. S. No. 1,289,530; Dec. 31, 1918.)

Kiln. Halver R. Straight, Adel, Iowa. (U. S. No. 1,290,848; Jan. 7, 1919.)

Kilns, Controllable Draft for Tunnel. John B. Owens, Metuchen, N. J. (U. S. No. 1,289,889; Dec. 31, 1918.)

Kiln, Muffle. John B. Owens, Metuchen, N. J. (U. S. No. 1,289,890; Dec. 31, 1918.)

Manganese Dioxide, Black Streak Depolarizing Agent. Carleton Ellis, Montclair, N. J., assignor to National Carbon Co., Inc., New York, N. Y. (U. S. No. 1,289,707; Dec. 31, 1918.)

Metal, Process of Annealing. John H. Bennett, Worcester, Mass. (U. S. No. 1,289,092; Dec. 31, 1918.)

Editorial Correspondence

SAN FRANCISCO, CALIF.—Feb. 28

The Pacific Coast Gold Mines Corporation, of which W. J. Loring is president and general manager, is the new owner and operator of the Dutch-Sweeney-App mines, near Jamestown, in Tuolumne County. These properties have been operated by the Loring interests for three or four years. The former owner of the Dutch and the Sweeney was the Dutch-Sweeney Mining Co., and the App mine was owned by the Neville estate. The Pacific Coast company now owns the three mines and the Dutch-Sweeney mill. The improved mill, put into operation in February, 1919, consists of two sets of rolls, a belt conveyor, two Hardinge ball mills of 8-ft. diameter, and one 16-cell Minerals Separation flotation plant. The recovery by this process so far shows a loss of 4 to 20c. per ton on ore running $4 per ton. The Dutch-Sweeney is opened by a 2300-ft. shaft. A large tonnage of low-grade milling ore is available. The Dutch-Sweeney mines were fairly developed at the time W. J. Loring optioned the property, and a 20-stamp mill had been installed. It was more a problem of metallurgy than of development, as the ore common to Mother Lode deposits is usually low-grade, but in well-defined veins or orebodies. The App mine is situated on adjoining ground, and was opened and operated by Captain Neville in the early days of deep mining, though the depth during Captain Neville's operation did not reach 2000 ft. The App is a natural adjunct to the Dutch-Sweeney property.

The Recent Purchase of the Morgan Mine, in Calaveras County, by the W. J. Loring interests, and the resultant new installation of operating and treatment plants at this property, together with plant improvements by the same interests at the Dutch-Sweeney-App mines, in Tuolumne County, mark an advance in operation of Mother Lode properties. The Morgan mine is now owned by the Carson Hill Gold Mines, Inc., W. J. Loring, president and general manager. The capitalization is $1,000,000, divided into 1,000,000 shares, of which 700,000 have been issued. The purchase price was about $500,000 in cash. The property embraces 450 acres in Calaveras County, north of Stanislaus River, and includes the town of Carson Hill. The main portion of the property is situated on the true (or middle branch of the) Mother Lode. The Morgan mine is on the eastern branch of the Mother Lode, which joins the central branch at Carson Hill, and embraces about 12 acres. The property was optioned by W. J. Loring on Nov. 10, 1916, and assignment was subsequently made to the Carson Hill Gold Mines, Inc., which exercised the option on the Morgan, Union and Kentuck claims, together with all the other properties possessed by the Morgan Mining Co., the former owner. The purchase was consummated on Dec. 28, 1918. During the life of the option, about 4000 ft. of development work was done and a fine body of high-grade milling ore was disclosed. The equipment installed by the present owner consists of a mining plant and a treatment plant situated at Melones, on the north side of the river. The mill consists of 20 stamps of 1250 lb. each, a Hardinge pebble mill, silver-plated copper plates for recovering free gold, two Deister sand tables and four Overstrom tables for recovery of fine concentrates, and one Wilfley table for re-treating middlings. The ore is delivered by belt conveyor from the mine to a 700-ton bin at Carson Hill, thence transported by Sierra Ry. to the Carson Hill Gold Mines plant at Melones. The sand and slimes are elevated by centrifugal pumps to a launder, which conveys this material to the cyanide plant of the Melones Mining Co., a distance of 1200 ft. The sands and slimes are separated and treated by cyaniding; also the concentrates recovered. The cyanide plant is leased to Symons & Latham, who have a contract to treat the Morgan mine slimes, sands and concentrates.

GOLDFIELD, NEV.—Feb. 25

The Goldfield Development Co., which was stated in the last issue to have leased the property of the Goldfield Consolidated Mines, was organized Feb. 13, 1919, under the laws of Nevada with a capital of $125,000 and 2,500,000 shares of assessable stock. Directors and officers are Corrin Barnes, president; A. I. D'Arcy, vice-president and general manager, and for several years manager of the Wingfield properties other than the Goldfield Consolidated Mines, and also consulting engineer for the Tonopah Divide property; H. G. McMahon, secretary-treasurer; A. H. Howe, former secretary and treasurer of the Goldfield Consolidated; and Benjamin J. Henley, of counsel for the latter company. An agreement has been made for the purchase of part of the ground of the Goldfield Consolidated Mines, and a bond has been taken for part, the remainder being held under lease for five years. According to the secretary-treasurer, H. G. McMahon, the company expects to conduct considerable development work on its own account and to sublease blocks to outsiders who care to carry on leasing operations. This work is now in progress by both the Development company and the sublessees. The four main shafts of the old company are being operated, as well as the pumps and surface equipment. Data are being gathered for determining the advisability of milling the oxidized zone in the Combination mine, which extends from the Florence mine to the January shaft, a distance of 1200 ft. In this section the ore channel, from which much of the early-day high-grade ore deposits was taken, has a width of from 40 to 100 ft., with a depth of 380 ft. The value of this material has not as yet been determined, but, should it prove to be of sufficient grade, the whole will be caved and drawn from the lower levels.

SALT LAKE CITY, UTAH—Feb. 27

A Wage Cut of 75 Cents Per Day at Park City went into effect on Mar. 1 and at many properties in Tintic. Food prices at these camps are said to be falling.

Dissatisfaction Over the Wage Reduction of 75c. per day at the Garfield smeltery of the American Smelting and Refining Co. has caused a small number of employees to go on a strike. The company has been making every effort to furnish employment to the largest number possible, and the copper furnaces are at present operating at a loss. Closing down these furnaces would be in the nature of a gain for the company. Under existing circumstances it is difficult to see what the men expect to attain by striking. However, the majority of the employees appear to recognize the fact that a little patience on their part is not out of order during the difficult period of readjustment.

Reorganization of the Judge Mining and Smelting Co., the Daly West and the Park-Utah companies, which are affiliated and operating in Park City, has been effected following the death of H. Otto Hanke, of Cincinnati, president of the three companies, the same interests, however, remaining in control. G. W. Lambourne has been made president of the three companies, and the directors show a wider range of membership. The Judge company is working 600 men in all, and in connection with mining is operating an electrolytic zinc plant, from which regular shipments of spelter are being made. The Daly West is being rejuvenated, and it is stated that the working force, at present of moderate size, is to be brought up to 150 men. The Park-Utah is being developed. This ground is in a new section of the camp, and a crosscut is being driven at the depth of the Ontario drain tunnel to determine its possibilities.

The Bill Regarding Taxation of Utah Mines, as passed by the State Senate Feb. 21, has been amended to read that assessment be fixed according to a sum "not to exceed three times the net proceeds." This settlement of the question is felt by those interested in the industry to be in the nature of a compromise. It had been hoped that some more accurate method would be adopted, according to which, as is done in Arizona, the probable life of the property to be assessed is taken into consideration. This, it is stated, is not possible, according to the Utah constitution. In regard to the taxation of metalliferous mines in particular, it is stated by the senator proposing the bill in the original form, fixing taxation "at three times the net proceeds," that the state board of equalization would fix the taxation of these mines at "three times the net proceeds." The words "not to exceed three times the net proceeds" were put in at the suggestion of the Governor of the state.

PHOENIX, ARIZ.—Feb. 28

Employees Laid Off at Bisbee number less than 500, it is stated locally. Many of those who were working in shafts that shut down have been taken on at other properties. In addition, several hundred soldiers have returned to their former work in or around the mines. At Ajo, a system of part-time employment is in effect. It is also to be noted that many men drifted into the district with the coming of cold weather who customarily leave when it gets warmer.

The Strike in the Verde District has been called off as casually and unaccountably as it was called. A local newspaper office has been furnished with a "Notice to Mine Workers," signed simply by "Strike Committee," stating that, "Owing to circumstances over which we have no control, we, the miners of Verde district, have decided to call the strike off." Mine managers, when advised, stated that the committee's announcement "cannot be taken seriously" and there is intimation that the larger works will not be reopened till radical agitators have left the camp. When the mines closed it was declared that they would not reopen within six months. A committee of foreign miners sent to call on Superintendent Smith, of the United Verde, was advised that the mine could not resume operations within six weeks, even if reopening were decided upon at once, for the main hoisting shaft is under repairs and much of its machinery has been brought to the surface. The same situation is true at the smeltery, where the shutdown is being utilized for relining reverberatories, though smeltermen who wish are being allowed to remain rent free in the company's cottages. Many of the Mexicans are preparing to return to their own country, and have asked for special railroad rates. Official investigators for the Department of Labor estimate that more than 1000 men have left the camps, though the school enrollment has dropped off little, indicating that the families have been left behind. H. S. McCluskey, committeeman of the International Union of Mine, Mill and Smelter Workers, recently advised the men to return to work, stating that in southern Arizona there are now at least 10,000 idle men, "so that there is no place for the idle of the Verde district to go to better their condition."

DENVER, COLO.—Feb. 27

Blue-Sky Legislation for Colorado is to be the subject of much discussion in both branches of the Legislature at this time. Several bills have been offered for consideration, and there is a wide difference of opinion as to the exact nature and wording of such a measure. The Senate and House judiciary committees do not seem to agree on the manner of bringing about such legislation. The Senate favors a speculative securities commission, whereas the House does not approve of a plan to have the sale of stocks passed upon by a committee of three men. The House judiciary subcommittee on "blue-sky" legislation, comprising Representatives Dolan, Fairfield, Golding, and Stephenson, is considering a draft that will protect the honest promoter. The Girard-Fairfield bill calls for publicity with regard to the stock-selling operations of mining, oil, and irrigation enterprises, but does not create a commission. According to this proposed measure, agents must have certified copies of the prospectuses and statements filed by the company with the Secretary of State's office, and misstatements by the agents are punishable by heavy fine and imprisonment. The Senate judiciary subcommittee comprises Senators Hetherington, Peterson, and Starkweather. These men favor the Knauss-Peterson bill, which provides for a commission consisting

of the Attorney General, the Secretary of State, and a third member to be appointed by the Governor, who shall be secretary and receive a salary of $3600 a year. The bill limits the commission of agents and brokers, and seeks to prevent company sales that are carried out by promoters for their own individual gain. This committee has been advised that many persons have been deceived in the purchase of private stock when they believed they were buying company securities. To prevent the sale of this private stock under misleading circumstances, the subcommittee will suggest that such securities and stocks contain a statement such as: "This certificate is a transfer of ownership of the stock represented by it and not for stock sold by the company." The cautionary wording is to be printed across the face of the certificate. One argument against the proposed creation of a commission is the recent unsatisfactory development in connection with "blue-sky" legislation in Nebraska, where the protection of the public from the sale of fraudulent securities is vested in the Railway Commission.

AUSTIN, TEX.—Feb. 27

The Bill To Provide a New Mining Law for Texas, introduced at Austin on Feb. 5 as Senate Bill 186 by Senator R. M. Dudley, of El Paso, was finally passed by the State Senate on Feb. 20. The bill embodies the features of the draft made by a committee of the El Paso Mining Circle, this organization having appointed S. H. Worrell, dean of the Texas School of Mines and chairman of the committee that prepared the draft, and E. F. Knott to go to Austin to endeavor to have the new law passed. General features of the draft were given in the "Journal" of Feb. 28 on page 292. Various amendments were offered, including one, which was adopted, providing that claims for sulphur shall not be confined to 1500 ft. in length and 600 ft. in width, but any single claim for sulphur may cover as much as 200 acres. Another amendment to make the miner pay 5% royalty on his gross production was tabled. An amendment, which was adopted, provided for making the price of the mineral land acquired $250 instead of $25 per acre, payable after five years.

DULUTH, MINN.—Feb. 27

Miners Employed in State-Owned Mines in Minnesota will be put under the provisions of the Workmen's Compensation Law by the action of a bill introduced by Senator Fred Bessette, of Orr, Minn. The bill is sponsored by the State Auditor's office, which has control of the state-owned mines. A Senate bill advocated by the Department of Labor, providing that all employment agency fees shall come entirely from the employer, is meeting strenuous opposition.

Reduction in Ore Freight Rates to the head of the Lakes is being sought by independent operators on the Minnesota ranges, who are urging the State Legislature to memorialize Congress to this end. They have so far succeeded in getting favorable action from the Senate Railways Committee. Prior to 1912, the rate was 80c. a ton from the Mesabi, and from 90c. to $1 from the Vermilion Range. In the spring of 1912, the D. M. & N. and the D & I. R. railroads voluntarily reduced their rate to 60c., and the Great Northern immediately followed. In June, 1915, in compliance with an order from the Interstate Commerce Commission, the rate on Mesabi and Vermilion ores was reduced to 55c. per ton, and in the spring of 1917 the same body authorized an increase to 63½c. One of the first acts of the U. S. Railroad Administration (W. G. McAdoo, Director General) on taking over the ore-carrying roads was an arbitrary raise to $1 per ton, effective July, 1918. It is now contended that this rate is entirely unreasonable, and that out of every dollar earned by the ore-carrying roads 51c. is used to bolster up weak lines in the railroad chain.

WEBB CITY, MO.—Feb. 27

The Community Drilling Corporation, recently referred to as in process of being organized by business men of Webb City, Mo., has for its object the development of the Webb City-Carterville mining district by a thorough drilling campaign. It is proposed that the drilling be conducted only on land under lease to the corporation, the latter to be reimbursed by royalties or cash payments, in consideration of development done, sufficient to keep capital unimpaired. All drillmen and helpers are to be residents of the Webb City district while so employed. Drilling is to be done on contract. Leases are to run for at least 10 years, to allow sufficient time to prospect them and interest capital. Royalties recommended vary from 3 to 10% to the landowner, according to the "mill recovery." Added royalties varying from ½ to 5% may be purchased by the operating company. The committee on organization recommended that at least 200 holes be drilled.

HOUGHTON, MICH.—Mar. 1

Reduction of Wages amounting to 15% was announced on Mar. 1 by Calumet & Hecla and subsidiaries, reëstablishing the scale existing in April, 1918. The cut affects all classes of labor. Similar reductions in pay by other mining companies in northern Michigan make the total number of employees thus affected about 18,000. Two of the mines, the Mass Consolidated and the Franklin, cut wages several weeks ago when confronted with the proposition of doing so or closing down. The decrease had been expected by the men. Action had been postponed by the companies as long as possible in the hope that the cost of living might lessen materially in the meantime.

NEW YORK—Feb. 27

Producers of Phosphate Rock have organized the Phosphate Export Co., under the Webb law, for the purpose of handling the export business in their industry. The company has no capitalization, and includes as members the producers of rock running more than 75% phosphate. Headquarters will be maintained in New York and branches will be established abroad. Tonnage to be allotted to the concern will depend upon the foreign demand that may develop. S. B. Fleming, president of the International Agricultural Corporation, has been an important factor in organizing the new company.

BOSTON, MASS.—Feb. 27

Suit Against the Iron Cap Copper Co., operating in Arizona, has been brought by the Arizona Commercial Mining Co., in the Massachusetts Supreme Court. Two separate actions have been begun, one alleging illegal extraction of ore from veins apexing in Arizona Commercial ground, and the other alleging that Iron Cap refuses to share equally the expense of draining ground within its boundaries. The properties of the two companies adjoin. The Arizona Commercial company alleges that in the last six years it has spent over $250,000 in draining its own ground, which automatically drained the lower levels of the Iron Cap. Under Arizona law, each company, when lying contiguous to the other and having a common ingress of water, is required to pay its proportionate part of the expense incurred in keeping the ground drained. Arizona Commercial alleges that it is entitled to at least $150,000 from the Iron Cap, and has attached the property of that company held by the State Street Trust Co. to the extent of $150,000. In the other action Arizona Commercial claims that the Iron Cap company, in the operation of territory between its two shafts, the Iron Cap and the Williams, has wrongfully extracted ore from veins that apex in Arizona Commercial's property. The plaintiff claims that more than 250,000 tons of ore from Arizona Commercial's veins has been mined, for which Iron Cap received over $3,000,000. The plaintiff has asked for an injunction restraining the company from further mining in this territory and from disposing of any of its assets. It has attached for $500,000 the property of the Iron Cap Copper Co. held in the State Street Trust Co. Hearing on both actions is set for Mar. 11. In its answer as trustee, the State Street Trust Co. sets forth that it has funds amounting to $67,061 belonging to Iron Cap. Officials of the Iron Cap company say they have been advised by what they believe to be competent authority that the suits brought by the Arizona Commercial are without basis. In fact, they say they have never, prior to February of this year, received any intimation that the veins now being worked by the Iron Cap Copper Co. apex other than on their property, and they do not believe that they do.

VICTORIA, B. C.—Feb. 28

Production of Copper is the most important phase of the British Columbia mining industry, both in respect of value of output and the number of men employed. Present market conditions have led here, as elsewhere, to an unsettled state of affairs as to the immediate future of the industry. The managements of the several large mining corporations most affected have adopted the policy of taking the men into their confidence, clearly stating to them that refusal to accept lower wages means cessation of operations, at least until the reestablishment of a more normal market, and placing on their shoulders to some extent the responsibility of decision. The smeltery employees of the Granby Consolidated Mining and Smelting Co., at Grand Forks, have agreed to continue at a wage based on the Butte scale. At Anyox, B. C., the chief industrial center of the Granby company, the attitude of the men is not yet definitely known. It is thought, however, that they are likely to adopt the same reasonable view as did those at Grand Forks. If this proves so, the operations of the company may not be seriously affected. The company has expressed its desire to do its utmost to keep the wheels moving. The Britannia Mining and Smelting Co. is meeting the situation by rather a different method, but by one which, in the last analysis, works out about the same. Men are being discharged, and the company's operations will probably be curtailed in a considerable degree. However, when the men are laid off they are given the option of returning to their jobs at a reduced scale. Many are accepting the proposition. Thus there is no reason for a competent man to be idle. There is no doubt that the relationship between manager and worker is changing in British Columbia. Those companies which have treated the representatives of the men as intelligent persons, and have taken the trouble to point out that with no income it is impossible to pay high wages, and to explain how it happens that there is no income at present, for the most part find their men standing behind them.

The Dolly Varden and Wolf Silver Mines, in the Alice Arm district of British Columbia, are to be taken over by the Temiskaming Mining Co., it was decided by the shareholders of the latter company at their annual meeting on Feb. 4. These mines have been handicapped for some time, it is said, owing to lack of finances, and the Temiskaming company has entered into an agreement whereby operations will be resumed. The railroad from the beach at Alice Arm to the Dolly Varden mine was practically rebuilt and nearing completion when the construction company went into liquidation, with the result that most of the mining properties and prospects of the district were tied up. Hopes were entertained, however, that an early adjustment of the railroad difficulties would be arranged, and negotiations to that end were undertaken. The Dolly Varden Mines Co. owns the Dolly Varden property, which is situated about 18 miles from tidewater on the west bank of the Kitsault River, and the Wolf property, two miles further up on the east bank of the Kitsault. The Dolly Varden has been extensively opened up by underground development, and is therefore in condition to start shipping at any time. The orebodies have been proved by thousands of feet of diamond drilling. On the Wolf property a tunnel 35 ft. long has been driven in on the orebody, from the face of which a crosscut to the north 50 ft. and to the south 10 ft. proves the orebody for a width of 60 ft., with neither wall in sight. Several thousand feet of diamond drilling has been done, proving the orebody and showing it to be of good milling grade. The British Columbia Legislature has before it a petition relative to the 18-mile railway which has been constructed from Alice Arm practically to the Dolly Varden mine. The petition sets out that the Taylor Engineering Co. spent $425,000 on the railway, almost completing it, without being repaid by the owners of the Dolly Varden. It is detailed that the Dolly Varden company was incorporated in 1917 and that subsequently arrangements were made with the Taylor Engineering Co. for the railway construction. The latter, it is said, got nothing more substantial than promises to pay. Negotiations having been entered into by the Dolly Varden company for the sale both of mines and railway, the contracting company, which since has gone into liquidation, although assured that its interests would be protected, began to manifest some concern, it being alleged that there appeared to be a disposition to attempt to evade responsibility. The petition is an effort to obtain legislative protection for the assets of the railroad builders as represented by the road, to which they were unable to give the finishing touches.

TORONTO, ONT.—Feb. 27

Hollinger Consolidated Gold Mines' arrangement, under which the company will sell its gold to the Ottawa mint, instead of in New York practically assures a bonus of 2% on production. The mint will pay for the gold in New York funds, which is equivalent to giving a 2% premium over the valuation of the Canadian dollar. The precedent having been established in the case of the Hollinger, it is assumed that any other gold-producing mine in Canada will be accorded the same terms.

Dome Mines Shareholders are much exercised over the terms of the reported deal for the Dome Extension. Two years ago the Dome company had an option on the Dome Extension on the basis of 50 shares of the latter for one share of Dome. The new deal is to be 30 to 1, and Dome shareholders are wondering why the Dome Extension should have appreciated in value to such an extent, particularly in view of the fact that there appears to have been a considerable accumulation of Dome Extension stock by the interests in control of Dome. No work has been done on Dome Extension since the Dome dropped its original option. Under the terms of the new deal, Dome is to spend $3000 a month on the property. The ore removed may be treated in the Dome mill, and, after proper allowances for working costs, the revenue derived will go to the Dome Extension treasury. In the event of the development on the Extension ground proving satisfactory, and sufficient profitable ore being developed to warrant the deal, an examination will be made by an independent engineer, before the Domes Mines company proceeds to exercise the option it holds.

The Proposed Leasing of Oil Territory in northern Alberta by the Canadian government to the Shell Oil and Transport Co., stated to be a subsidiary of a Dutch company with extensive ramifications, is meeting with strong opposition in Western Canada. On Feb. 18 the question was brought up in the Alberta Legislature, and a resolution condemning the transaction was unanimously adopted. At a meeting of 150 oil men held in Edmonton it was stated that the area it was proposed to hand over to the Shell company included a territory 700 miles long and extending over the whole width of the province. Capt. James Anderson, representing a group of British investors, said that he had seen, when in London, the charter which it was proposed to give to the company, and stated that it was the intention of the latter to build pipe lines to the Pacific Coast and to Fort Churchill, on Hudson Bay, and send the oil to Europe. A strong protest against the consummation of the deal was forwarded to Ottawa, together with a message to the members of Parliament representing Edmonton, asking them to demand full particulars from the government regarding the matter.

SYDNEY, AUSTRALIA—Jan. 28

Broken Hill Mines are at present the only Australian producers of zinc ores, though many other mines are capable of producing them. The output in 1918, according to figures published, was as follows: Lead concentrates, 261,193 tons, averaging about 62% lead; zinc concentrates, 347,610 tons, averaging 47% zinc. The excess of zinc concentrates comes from the large amounts of "old" zinc sands and slimes worked up by three of the Broken Hill companies. Before 1914 the zinc-distillation works of the Broken Hill Proprietary Co. at Port Pirie was the only plant of that character in operation. It was a small plant erected more as a test than as a commercial producer of spelter. Spelter of good grade has been regularly produced at this plant at the rate of about seven tons daily. The property is now owned by the Associated Smelters, of Port Pirie, a combination of Broken Hill mines, to which the Broken Hill Proprietary Mines sold the plant about four years ago. The spelter department of the works has not been enlarged since it was taken over, though the lead department has been expanded until it is now capable of absorbing the whole of the output of lead concentrates. The cessation of exports of zinc concentrates to Europe naturally turned the attention of zinc producers toward establishing their own spelter works, and the successful manufacture of electrolytic spelter in the United States indicated that it would not be advisable to enlarge the existing Port Pirie spelter plant. The Amalgamated Zinc company, of Broken Hill, always the pioneer of progress in treatment of Broken Hill ores, tested its zinc concentrates in bulk, and found them amenable to the processes for making electrolytic spelter. Tasmania being the only state possessing considerable resources of hydro-electric power, though mostly undeveloped, a site was secured at Risdon, near Hobart, with good shipping facilities, and the first electrolytic spelter works of Australia were built and have been making excellent spelter for nearly two years. The plant was originally planned for a capacity of 100 tons of spelter daily. Mainly owing to the slowness of development of hydro-electric power by the Tasmanian government, the daily output is only about 10 tons. The two plants mentioned can today absorb about 12,000 tons of roasted zinc concentrates yearly, an amount entirely inadequate for the production of which they should be capable. The zinc sands resulting from the milling of the lead concentrates must either be made into zinc concentrates or stacked for future treatment, and it is found more economical to treat them as they are made. In consequence, stocks of zinc concentrates have been growing during the last four years at the rate of over 250,000 tons per annum, even after allowing for what was exported to the United States and Japan during the first years of the war. The Mount Read-Roseberry group of mines has been developed under the technical direction of Mount Lyell, being situated in practically the same district. Large quantities of zinc-lead ores have been proved and found suitable for the electrolytic-zinc processes. Until recently it was projected to erect large milling and flotation plants near these mines and, later, electrolytic spelter works in connection therewith. Ample water power was available but undeveloped. The Mount Lyell company several years ago had developed sufficient hydro-electric power from Lake Margaret for its own works and mines, and it was found that about 45,000 hp. could be developed from the King River, near the Mount Read mines. It has been announced, however, that under an agreement just made, all the zinc and lead concentrates made at the Mount Read-Roseberry works will be treated at the Risdon works. The latter are to be enlarged up to a daily capacity of 1750 tons of zinc concentrates. If this figure is correctly reported by the newspapers, such capacity would take care of the entire Broken Hill and Mount Read-Roseberry output, and leave room for some of the other mines at present idle for want of outlet. The Mount Read company would be saved the large outlay for separate electrolytic works, and the Risdon works would have a monopoly of Australian spelter, inasmuch as the owners of the Risdon plant are practically the same as those of the Associated Smelters, of Port Pirie. In view of the difficulties of developing sufficient hydro-electric power, and also of the fact that many works in the United States are closed, it seems unlikely that the ambitious scheme indicated will be realized before 1923 or 1924, entailing a delay of four or five years.

The Mining News

ARIZONA

Cochise County

SHATTUCK-ARIZONA (Bisbee) — Operations suspended owing to fire which broke out on Feb. 25 between 700 and 800 levels. Shaft bulkheaded at 700 so as to permit flooding to that level if necessary.

Mohave County

McCRACKEN (Signal)—Old 20-stamp mill, built about 1876, now being junked. Turned out much silver-lead bullion in pioneer days.

Pima County

AJO-CORNELIA (Ajo)—Sued by Tucson contractors for diamond-drill work. Ajo stockholders allege fraud on part of company officers and have appealed for investigation by State Corporation Commission.

LITTLE AJO (Ajo)—Diamond drilling in progress; in rhyolite at 200 feet.

BLACK PRINCE (Ajo)—Under investigation by Corporation Commission on charge of selling stock without authority.

Pinal County

RAY CONSOLIDATED (Ray)—New automatic man hoist installed at No. 4 man shaft in No. 2 mine.

Santa Cruz County

TRENTON-GEORGIA (Tubac)—To be operated under leases by St. Louis company, headed by A. R. Grund, which lately took option on northern half of 100,000 acre Baca Float land grant. Mine in Santa Rita Mountains, and pioneer producer of lead-silver ores.

Yavapai County

GADSDEN (Jerome) — Operations resumed after week's shutdown.

GREEN MONSTER (Jerome) — Work stopped indefinitely until costs come down and conditions are more stable.

VERDE COMBINATION (Jerome) — Work resumed after one-week shutdown.

ARKANSAS

Marion County

BEULAH (Rush)—Arkansas Mining Co. operating mine and mill steadily. Hauling output to shipping point at Yellville.

DRY PROCESS MILL built at Yellville last year will be run on custom ore. Has been operated at intervals since completion.

NORTH STAR (Yellville)—Good-grade zinc carbonate again struck. Large body of milling ore developed.

ONWATA (Yellville)—Small concentrator recently put in operation. Several months' supply of mill ore on dumps.

CALIFORNIA

Amador County

ARGONAUT (Jackson)—Installing steel water tower 166 ft. high for fire protection. Capacity 50,000 gallons.

Calaveras County

CALIFORNIA CALAVERAS (San Francisco)—Superior Court petitioned to dissolve company; incorporated in 1907 with $2,500,000 capitalization. Principal stockholder, David T. Adams.

Plumas County

ENGELS (Engelmine)—To extend Indian Valley R.R. to upper camp. Installing large settling tank near flotation plant. Labor supply now abundant. Lower tunnel of Big Chief advancing rapidly.

Shasta County

AFTERTHOUGHT (Ingot)—Expect to resume operation of mill latter part of March. New reverberatory will be ready for operation about Apr. 1, and will be put into service promptly.

MOUNTAIN COPPER (Keswick)—Wages reduced to scale of July 15, 1918, average cut being about 50c. a day; 475 men affected. Miners reduced from $4.50 to $4; muckers from $4 to $3.50. Surface men suffer smaller decrease, because wages were not increased in same proportion.

Tulare County

YOU KNOW (Porterville)—Property on Cow Mountain reported sold by Creeks brothers to Douglas brothers and A. Burbach. Equipped with three-stamp prospecting mill.

Tuolumne County

MOUNTAIN LILY (Columbia)—Clean-up from development in last two months yielded lessees $4000. Property formerly producer.

COLORADO

San Juan County

EMPIRE STATE MINE AND REDUCTION (Eureka) — Recently incorporated under Colorado laws. Officers and directors: William Akers, Fred Kunz and William Gooch. Properties near Sunnyside mine. Considerable development work done, and payable lead-zinc ores, occasionally running high in silver, opened. Trial shipments made. Erection of 50-ton mill near Eureka considered.

CALEDONIAN M. AND M. (Silverton)—Has developed Peerless San Juan property, and is milling ore successfully and shipping concentrates regularly. Much commercial ore opened.

CHAMPION (Silverton) — Being developed under lease by Roy Crawford, Hardin Morris and Dominic Giono. Commercial

gray-copper ore carrying silver recently opened. Ore packed from mine to railroad, and shipped to smeltery at Durango. Vein from 3 to 4 ft. wide.

San Miguel County

PRIMOS CHEMICAL (Vanadium)—Reduction plant burned recently, entailing $100,000 loss. This was largest vanadium ore-treatment plant in Colorado. Cause of fire unknown. Rumored that mill will be rebuilt. Company had recently opened and equipped additional mining properties near by.

MICHIGAN

Copper District

FRANKLIN (Demmon)—Mass of copper estimated to weigh two tons found on 30th level north on Pewabic amygdaloid, being largest yet found in mine. Output increasing, 1300 tons daily being expected during first part of March. Regrinding mill of Hardinge type put into operation Feb. 28. Initial results satisfactory.

MINNESOTA

Cuyuna Range

IDA MAE (Crosby)—Hoisting 85 to 90 tons high-grade manganiferous ore per day.

NORTHLAND (Cuyuna) — Drifting to orebody on 169 level, and cutting station and pump-room on 189 level. Will be in ore early in March.

CUYUNA-MILLE LAC (Ironton)—Will deepen shaft 50 feet.

FEIGH (Ironton)—American Bridge Co. completed erection of steel headframe. Permanent hoist foundation completed. Considerable construction and installation will be done this spring.

JOAN NO: 3 (Ironton)—Shaft which was bottomed recently stopped temporarily.

ADBAR DEVELOPMENT (Trommald)—Cuyler Adams, of Duluth, has leased from Cuyuna Fee Co. N. ½ of N.W. ¼ of Section 4, 46-29. Consists of 80 acres of iron-bearing land and lies about two miles northwest of Crosby. Small shaft sunk and enough development done to indicate presence of considerable high-grade ore. Royalty based on sliding scale, with a minimum of 25c. for merchantable ore.

ALGOMA (Trommald)—Has 30,000 tons manganiferous ore in stock.

FERRO (Trommald)—Started sinking shaft again, from 150 to 275 level, after delays owing to waiting for pumps, concreting sump, and other causes.

MERRITT (Trommald)—Producing 450 tons manganiferous ore per day, from three shafts. Shaft No. 1 will be sunk from 120 to 220 level.

Mesabi Range

OLIVER (Eveleth)—Mild weather has permitted continuation of concrete work on Leonidas concentrator. Steel work being carried on, and some machinery already on ground. A 6500-ft. trestle is being filled at rate of 2500 ft. per month to make settling basin. At Spruce mine four shovels operating; also two at North Leonidas and two at Fayal, one on each of the high banks on east and west sides.

MONTANA

Silver Bow County

BUTTE & SUPERIOR (Butte)—Argument in Minerals Separation litigation, slated for Mar. 3, postponed until Mar. 19 by U. S. Supreme Court.

EAST BUTTE (Butte)—Smeltery started up again on Mar. 1, 24 hours in advance of opening hour announced to custom shippers.

NORTH BUTTE (Butte)—Output reduced to approximately 450 tons ore per day.

NEVADA

Lincoln County

PIOCHE DISTRICT ore shipments for week ended Feb. 20 were: Prince Consolidated, 26 cars; and Virginia-Louise, eight; for week ended Feb. 27: Prince Consolidated, 24 cars; Virginia-Louise, nine; and Harney (Stindt and Donohue lease), one.

Nye County

TONOPAH SHIPMENTS for week ended Feb. 22 were 7130 tons, having gross milling value of $121,210. Shippers were: Tonopah Belmont, 2185 tons; Tonopah Mining, 1050; Tonopah Extension, 2136; West End, 819; Montana, 357; Tonopah Divide, 210; MacNamara, 210; Midway, 53; North Star, 55, and miscellaneous, 55 tons.

MacNAMARA (Tonopah)—Have about completed installation of filters, thickeners, classifier and other equipment which will double present capacity of mill, for purpose of taking greater tonnage of Tonopah Divide company's ore. Present daily milling capacity is 85 tons.

White Pine County

CONSOLIDATED COPPERMINES (Kimberly)—January production of copper was 1,366,136 lb.; December, 1,637,997 lb. Notice dated Feb. 26 announces temporary suspension of all production owing to market conditions. Will push development in Alpha mine. Drifts to west on 1100 and 1200 levels of Alpha still in shipping ore. Crosscut on 1300 level recently cut high-grade in face. Will unwater shaft to 1400 level preparatory to starting development on that level.

NEW YORK

Essex County

CHEEVER (Port Henry)—Iron-ore properties of this company closed down indefinitely.

UTAH

Juab County

UTAH APEX (Bingham Canyon)—Operating forces materially decreased following drop in price of lead.

PLUTUS (Eureka)—Crosscut from Chief Consolidated shaft on 1000 level opened rich ore in fossiliferous limestone (not the usual ore-bearing limestone of camp), and stoping ore about 50 ft. below where ore-bearing limestone was expected. Property recently acquired by Chief Consolidated.

EAGLE & BLUE BELL (Eureka)—Lead-silver ore of shipping grade, which was opened on 1875 level 400 ft. southeast of shaft, proved from 1700 to 1875 level and still going down. Drifting begun on 2000 level 20 ft. above water level to reach body from below. January shipments by company 45 cars, and 1918 shipments 714 cars.

Salt Lake County

TINTIC SHIPMENTS for week ended Feb. 22 totaled 145 cars.

MIDVALE MINERALS (Midvale)—Retreating dump from old United States mill; increasing mill capacity to 375 tons daily. New Dorr classifiers installed and new-type thickener.

Summit County

PARK CITY SHIPMENTS for week ended Feb. 22 were 4,648,000 lb. of crude ore and concentrates.

THREE KINGS (Park City)—Property including 150 acres adjoining Silver King Coalition and Silver King Consolidated has opened five-foot mineralized fissure on 500 level.

WASHINGTON

Stevens County

LEAD TRUST (Boundary)—To advance No. 2 tunnel to reach extension of orebody developed on No. 1 level. Equipment being installed, including 60 hp. boiler, 25 hp. engine and compressor.

UNITED COPPER (Chewelah)—Mill in experimental stage, and no definite changes made to date. Analysis of mill feed as follows: Gold, 0.005 oz.; silver, 2.1 oz.; copper, 0.7%; insoluble, 75.6%; iron, 4.4%; sulphur, 1%, and lime, 3.2%. Possibility demonstrated of making concentrates averaging 62.50 oz. silver, 21% copper, containing 96.8% of total silver and 91.2% total copper. Ratio of concentration by assays of copper products is 41 to 1. Gangue is schist containing chalcopyrite and tetrahedrite. Mill now producing concentrates averaging 15% copper and 30 oz. silver. Present output about 300 tons concentrates and 60 tons crude ore per month, latter averaging 16% copper and 92 oz. silver.

CANADA

British Columbia

CANADA COPPER (Allenby)—Large part of machinery for new concentrator is at Princeton awaiting completion of branch railway to Allenby.

ROCK CANDY (Grand Forks)—Aërial tramway from fluorspar property to spur extension of Kettle Valley Ry. almost complete. Consolidated M. and S. Co. developing this group.

GIBSON (Kaslo)—Hydro-electric power plant nearing completion. Property includes seven claims, with surface plant. Ore chiefly milling grade, with scattered high-grade. Mill construction probable, depending on securing of funds. Situation seven miles from railroad, company owning its own hauling equipment. William W. Elmer, engineer in charge.

SILVER BELL (New Hazelton)—Has made first shipment of high-grade ore.

CONSOLIDATED M. AND S. (Princeton)—Diamond drilling begun on Voight claims on Copper Mountain.

STANDARD SILVER LEAD (Silverton)—About 25 men on development. Mill running one shift and handling ore from Echo mine.

WAKEFIELD (Silverton)—Recently acquired by Clarence Cunningham. Development progressing.

NOBLE FIVE AND IVANHOE mines, in Slocan district, have resumed operations with full crews, after being practically closed down by influenza.

SILVERSMITH (Slocan)—Oreshoot recently opened on tenth level followed 305 ft., extending 100 ft. into ground hitherto undeveloped on any level. Mill operation prevented by weather and shortage of water; will resume about Apr. 1. Three cars of crude ore shipped last month.

LUCKY JIM ZINC (Zincton)—Arrangements made for one-month trial run of ore in concentrator built at Alamo, B. C., by Clarence Cunningham.

Manitoba

PINEROOT CLAIMS (Athapapuskow Lake)—Six claims owned by E. L. Masterson, Dr. Robertson, W. J. Young, and J. Maxwell sold to C. W. Greenlees, representing Duluth syndicate. Ore copper sulphide.

Ontario

CHARLEBOIS—AUTHIER (Boston Creek)—Purchased by George Morris, of Buffalo. Adjoins Cullen-Renaud on north.

COTTER (Boston Creek)—Officially stated that orebody over 28 ft. wide has been cut by diamond-drill hole at vertical depth of 492 ft. Average gold content of core, $12.42 per ton.

McCREA-O'NEILL (Boston Creek)—Claims adjoining Miller Independence on northwest sold to George Morris, of Buffalo, vendors retaining small interest.

MILLER INDEPENDENCE (Boston Creek)—Plan of operation changed. Instead of driving inclined shaft on main vein, will sink vertical central shaft south of vein, to depth of 550 or 600 ft., to cut vein which is dipping to south.

COBALT SHIPMENTS from seven mines week ended Feb. 21 totaled 575,000 lb. ore as follows: Penn Canadian, 104,299; Kerr Lake, 80,255; La Rose, 81,425; Buffalo, 80,000; Coniagas, 80,000; O'Brien, 63,996; Hudson Bay, 61,531 lb. Mining Corporation was only shipper of bullion during period.

ADANAC (Cobalt)—Shipped 100 tons medium-grade ore to Dominion Reduction Company.

KERR LAKE (Cobalt)—January production was 118,985 oz. of silver, as compared with 102,289 oz. in December and 204,641 oz. in January, 1918.

TRETHEWEY (Cobalt)—Annual statement shows production for 1918 of net value of $250,534; operating costs, $147,166; operating profit, $103,368. Mill treated 34,546 tons, containing 10.2 oz. silver per ton. Estimated silver contents of ore reserves was 159,172 ounces.

PARAGON HITCHCOCK (Elk Lake)—Crosscut on 100 level has cut narrow veins, one carrying niccolite and silver. Sinking continued to 300 level.

HUDSON BAY (Kirkland Lake)—Operations financed; work to be started soon.

TECK HUGHES (Kirkland Lake)—Increasing force, now having 80 to 100 employed.

DAVIDSON (Porcupine)—Shaft unwatered and sinking resumed.

DOME LAKE (Porcupine)—Developing new orebodies of much higher grade than formerly mined. New development on 600 level.

HOLLINGER (Porcupine) — Company sampling old tailings to see if re-treating will pay.

KEORA (Porcupine)—Two diamond-drill holes put down 800 ft., cutting five veins found on surface which continue strong at depth.

VIPOND-NORTH THOMPSON (Porcupine)—Arrangements effected to secure funds for early resumption of operations.

LUCKY CROSS (Swastika)—Control of property passed into new hands; plans being made for reopening in spring.

MEXICO

AMERICAN MINING PROPERTIES in northern Mexico ordered guarded by Mexican federal troops; 200 stationed at Santa Eulalia, Cusihuiriachic, and Madera, owing to bandits' threat to destroy properties and kill American employees unless large sum was paid by March 1.

The Market Report

SILVER AND STERLING EXCHANGE

Feb. Mar.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Mar.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
27	4.7575	101⅛	47⅜	3	4.7575	101⅛	47⅜
28	4.7575	101⅛	47⅜	4	4.7575	101⅛	47⅜
1	4.7575	101⅛	47⅜	5	4.7575	101⅛	47⅜

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Feb. Mar.	Copper Electrolytic	Tin Spot.†	Lead N. Y.	Lead St. L.	Zinc St. L.
27	15 @15½ 14⅞	66¼	5¼	5.05 @5.10 5.05	6.25 6.25
28	@15½ 14⅞	66¼	5¼	@5.15 5.05	@6.30 6.20
1	@14⅞ 14⅞	67¼	5¼	@5.10 5.05	@6.25 6.20
3	@14⅞ 14⅞	67¼	5¼	@5.10 5.05	@6.25 6.17½
4	@15 14⅞	68	5¼	@5.10 5.05	@6.22½ 6.15
5	@14⅞	68	5¼	@5.10	@6.20

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. Special shapes command a premium and cathodes sell at a discount of 0.125c. per lb.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

†For American tin of 99% grade.

LONDON

Feb. Mar.	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
27	75	70⅜	(a)	222	214½	29	22½	40
28	75	71⅛	82	230	218	28½	23	41
1								
3	74	70	81	230	221	28	23½	40
4	74	70½	80	227	218	28	23½	38
5								

(a) No quotations.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

Metal Markets

NEW YORK—Mar. 5, 1919

The last week is noteworthy for the largest transactions in copper since November, but the sales were made at a terrible sacrifice in price. The activity in lead continued during the first two days of the week, but then petered out. Zinc was dull and soft.

Copper—With the market on the basis of 15½c. at the close of last week, some considerable buying by consumers was attracted. All producers, large and small, entered the market and competed eagerly for the business. Although sales on Thursday amounted to about 5½ million lb., and those of Friday to about 4½ million lb., offerings were in excess of demand, and the price was forced down to 14¾c. before the end of the day. On Saturday there was some real pressure, and round lots were booked as low as 14⅜c. A similar condition prevailed during Monday. The big producers did not follow the market down and were unwilling to sell below 15c., delivered, equivalent to about 14¾c., New York. On Tuesday the market stiffened a little, and some considerable sales were made. During the afternoon brokers were reported to be bidding quite generally 14⅜c. in behalf of consumers. On Wednesday, however, demand ceased about as abruptly as it had begun at the beginning of the week, and nothing but trifling business was done. The sales of electrolytic copper during the week, as reported to us, aggregated about 20,500,000 pounds.

A further conference with representatives of the War Department respecting the taking over of the Government's copper was held on Monday. Although a general agreement was reached, the settlement of all details and the drawing of the contract had not yet been done. Reports in the newspapers have been inaccurate.

Copper Sheets—The base price of copper sheets is 23½c. per lb. Copper wire is quoted at 18@18½c. per lb. f.o.b. mill, carload lots.

Tin—There is scarcely anything to report.

Lead—The active demand that developed last week continued during Thursday and Friday, but after the latter day business fell off decidedly. The St. Louis market has been relatively higher than New York, but during the last week the price there eased a little. There has been some gossip about better than 5¼c., New York, having been realized, but there is no confirmation of it, and no better price was obtained by any of the important producers. Bonded lead is continuously offered for export, and from time to time some orders are booked, apparently from consumers who prefer to buy directly from producers rather than from the governments, which perhaps are not liquidating their stocks in the simplest ways. We estimate the world's accumulation of pig lead at something over 300,000 tons, but, according to all indications, the market is being handled in a conservative and intelligent way, and there seems to be neither any tendency nor any necessity to make unnecessary sacrifices.

Zinc—The dullness that continues in this market is appalling. Curtailment of production is becoming more general, but perhaps is not yet as much as it ought to be. We imagine that the existence of the large accumulation of scrap brass must be a blight upon the spelter market for some time to come.

Zinc Sheets—The quoted price of zinc sheets is $11 per 100 lb.

Other Metals

Aluminum—Unchanged.

Antimony—The market was dull and unchanged at 7@7¼c. for spot. March-April shipments from China were offered at 6¾@6¾c., New York, duty paid, and some sales were reported.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.20 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.40 per lb. in lots of 500 pounds.

Nickel—Market quotation; Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Easier. We quote $78@80 at the close. San Francisco reports, by telegraph, $83, unsteady.

Silver and Platinum

Silver—The silver situation remains unchanged. London official price, 47⅞d.; New York official price, $1.01⅛ for 999 fine.

Advices have been received from London of shipment of Mexican coin to China. Further shipments are expected. No silver was shipped to London last week from New York; shipments from San Francisco to the East for January, 12,900,000 ounces.

Mexican dollars at New York: Feb. 27, 77½; Feb. 28, 77½; Mar. 1, 77½; Mar. 3, 77½; Mar. 4, 77½; Mar. 5, 77½.

Platinum—Refined ingot, $97.50@100.

Palladium—We quote $115@120.

Zinc and Lead Ore Markets

Joplin, Mo., Mar. 1—Blende, per ton, high, $47.80; basis, 60% zinc; premium, $45; Class B, $43; Prime Western, $42.50@42; sludge and slimes, $41@37.50; calamine, basis 40% zinc, $28@27. Average selling prices: Blende, $41.10; calamine, $31.18; all zinc ores, $40.62.

Lead, high, $57.75; basis 80% lead, $60@50; average selling price, all grades of lead, $54.60 per ton.

Shipments the week: Blende, 10,988; calamine, 550; lead, 1525 tons. Value, all ores the week, $552,140.

When the Prime Western grades were selling on $41@40 basis preparations were made by a number of mine owners to cease operations until market conditions were better. Then the price was boosted to $42.50 for these grades, and none ceased outputting that could make any margin of profit. Consequently, instead of reducing the production to approximately 8000 tons per week, it is 10,000 tons or over.

Of 98 zinc-smelting blocks in Kansas and Oklahoma, reported upon, 63 are in active operation, making approximately two-thirds of the smelting capacity producing spelter.

Platteville, Wis., Mar. 1—Blende, basis 60% zinc, $45 base for premium grade and $41.90 base for high-lead blende. Lead ore, basis 80% lead, $50 to $55 per ton. Shipments reported for the week are 1970 tons blende and 192 tons galena. For the year to date the totals are 15,365 tons blende, 717 tons galena and 73 tons sulphur ore. During the week 2369 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Freely offered without finding buyers.

Manganese Ore—Conditions of surplus supply continue unchanged.

Molybdenum Ore—Molybdenite is nominally quoted at 85c. per lb. of molybdenum sulphide content, sellers being willing to accept that price.

Tungsten Ore—No business was reported. A nominal quotation is perhaps $8.50@9.

Other Minerals

Pyrites—Spanish pyrites unchanged at 16.5c. per unit on the basis of 10s. ocean freight.

Iron Trade Review

NEW YORK—Mar. 5

Stabilized prices are regarded as the need, according to the "Iron Age." There have been three months of them, and the producers count on being able to maintain them without Government intervention. The plane might be lowered, but the suggestion is that the same strong hands that produce most of the steel of the country might definitely state the period in which n change would be made, as, for instance, up to July 1. Then buying, which could hardly have been expected at any price in the period of recovery from war shock and of readjustment, would materialize. Any cut, even a sharp one, which leaves also the impression of further recessions at early rather than future dates, would not be conducive to developing business.

Producers are, if anything, more outspoken in the expectation that labor readjustment will be necessarily long delayed. This and the commonly overlooked fact that this country's industry will not move independently of the rest of the world promise little in the way of drastic price revisions.

February's production of pig iron was 2,940,168 tons, or 105,006 tons per day This is 1519 tons less than the daily out-

put of January. On Mar. 1 there were 306 furnaces in blast, making iron at a rate of 101,475 tons daily, against 323 furnaces on Feb. 1, operating at 104,405 tons. In the month improved furnace operation was obtained, due probably to better coke. One group made 4000 tons more in the 28 days of February than in the 31 days of January, notwithstanding there was a net loss of four furnaces in blast by March 1.

PITTSBURGH—Mar. 4

Last Thursday there was a conference in New York between a few steel producers and George N. Peek, chairman of the newly formed Industrial Board of the Department of Commerce, which was created to carry out Secretary Redfield's plan of "price suggestion" whereby wartime prices for commodities would be "demobilized." Mr. Peek outlined the plan, but the steel makers present did not commit themselves. Judge Gary has now called a general meeting of the iron and steel industry to be held in New York next Thursday, Mar. 6, to consider the proposition. Though nearly all members of the steel trade individually express themselves as opposed to Secretary Redfield's proposal, there is scarcely room for doubt that the meeting to discuss prices proves welcome.

The majority of independent producers feel that there should be price reductions of considerable extent, either now or in the near future, but the Steel Corporation apparently does not favor reductions. This is a reversal of the alignment at the meeting on Dec. 9, 1918, when Judge Gary had to exert himself to secure assent to the proposition that reduced prices should be recommended to the War Industries Board. Though the suggestion was not entertained by the board, as it intended to disband, the suggested reductions became effective, averaging about $4 a ton on finished-steel products as a whole. The idea now is that there ought to be reductions of at least $5 to $10 a ton, to instill confidence in the minds of buyers. Undoubtedly steel prices will decline within a short time, but it cannot be forecast that the decline will occur immediately after next Thursday's meeting. The time of the reduction depends upon whether the steel producers conclude that it is better to forestall action by the Redfield board by making reductions at once, or prefer to hold prices until reductions are arranged by that board. It may be assumed that, if voluntary reductions were made, the board would call for additional reductions.

New buying of steel products has experienced a further decline, and there is also a decrease in specifying against old contracts, and the steel industry is faced with a further curtailment in operations unless something is done. Operations to date have been remarkably heavy, considering the general industrial inactivity, and still average fully 75% of capacity, which means that considerably more steel is being made than at any time previous to the war. Little of this steel is accumulating in the hands of producers, and how so much is absorbed by buyers is not known. Steel prices are firmly held all along the line. There are reports of price cutting, but investigation usually proves them to be incorrect.

Pig Iron—Despite the extreme lightness of demand, there has been enough inquiry for foundry iron to bring out definitely lower quotations, and this grade can be reported at $1 a ton decline at least. For basic, there has been no inquiry, except as to a lot of 14,000 tons for export, on which it is reported one seller cut the regular price by $4 and another by $2, but this does not reduce the quotable domestic market. The market is quotable soft at $1 decline on foundry and at former prices for steel-making iron, as follows: Bessemer, $32.20; basic, $30; foundry, $30; forge, $29, f.o.b. Valley furnaces, $1.40 freight to Pittsburgh.

Steel—Scarcely any inquiry, and prices are nominally maintained at $43.50 for billets, $47 for sheet bars and small billets, $46 for slabs, and $57 for wire rods.

Ferroalloys

Ferromanganese—One or two steel makers in Youngstown, who did not cover as far ahead as others, have been picking up resale ferromanganese in small lots for their current operations, and have been able to do $150, seller's works, for 80% Producers are asking $200 for 80% and $170 for 70%, delivered, against the wartime price of $250 for 70%, but they have been unable to make sales. Spiegeleisen is nominal at about $55, furnace, for 16%.

Coke—Less demurrage coke is pressing the market, but, on the other hand, operators have come down on regular lots, and will sell furnace grade at $4.50 in almost any tonnage. March adjustments on open contracts are likely to be made at this figure. Foundry is $5.50@6, depending on tonnage and brand, all prices being per net ton at Connellsville region ovens.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1917	1918	1919	1917	1918	1919
Jan.	75.630	88.702	101.125	36.682	44.356	48.438
Feb.	77.585	85.716	101.125	37.742	42.792	48.027
Mar.	73.861	88.082	.....	36.410	43.620	.....
April	73.875	95.346	.....	36.963	47.215	.....
May	74.745	99.505	.....	37.940	48.980	.....
June	76.971	99.500	.....	39.065	48.875	.....
July	79.010	99.625	.....	40.110	48.813	.....
Aug.	85.407	100.292	.....	43.418	49.077	.....
Sept.	100.740	101.125	.....	50.920	49.500	.....
Oct.	87.332	101.125	.....	44.324	49.500	.....
Nov.	85.891	101.125	.....	43.584	48.969	.....
Dec.	85.960	101.125	.....	43.052	48.492	.....
Year	81.417	96.772	.....	40.851	47.516	.....

New York quotations cents per ounce troy, 999 fine; London, pence per ounce, sterling silver, 925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1918	1919	1918	1919	1918	1919
Jan.	23.500	(a)	110.000	92.238	125.000	106.619
Feb.	23.500	16.763	110.000	78.700	125.000	95.700
Mar.	23.500	.....	110.000	.....	125.000	.....
April	23.500	.....	110.000	.....	125.000	.....
May	23.500	.....	110.000	.....	125.000	.....
June	23.500	.....	110.000	.....	125.000	.....
July	25.904	.....	119.913	.....	134.913	.....
Aug.	26.000	.....	122.000	.....	137.000	.....
Sept.	26.000	.....	122.000	.....	137.000	.....
Oct.	26.000	.....	122.000	.....	137.000	.....
Nov.	26.000	.....	122.000	.....	137.000	.....
Dec.	(a)	.....	118.447	.....	133.167	.....
Year	24.628	.....	115.530	.....	130.507	.....

(a) No Market.

Tin	New York		London	
	1918	1919	1918	1919
January	85.500	67.702	293.227	248.557
February	92.000	66.801	311.525	223.963
March	(a)	.....	318.875	.....
April	(a)	.....	329.905	.....
May	(a)	.....	364.217	.....
June	(a)	.....	331.925	.....
July	(a)	.....	360.347	.....
August	(a)	.....	380.900	.....
September	(a)	.....	343.905	.....
October	(a)	.....	335.543	.....
November	(a)	.....	323.550	.....
December	(a)	.....	267.736	.....
Av. year	(a)	.....	330.138	.....

(a) No average computed.

Lead	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	6.782	5.432	6.684	5.316	29.00	37.227
February	6.973	5.057	6.899	4.784	29.00	28.675
March	7.201	.....	7.091	.....	29.00	.....
April	6.772	.....	6.701	.....	29.00	.....
May	6.818	.....	6.704	.....	29.00	.....
June	7.611	.....	7.511	.....	29.00	.....
July	8.033	.....	7.750	.....	29.00	.....
August	8.050	.....	7.750	.....	29.00	.....
September	8.050	.....	7.750	.....	29.00	.....
October	8.050	.....	7.750	.....	29.00	.....
November	8.050	.....	7.750	.....	31.20	.....
December	6.564	.....	6.324	.....	40.00	.....
Year	7.413	.....	7.222	.....	30.10	.....

Spelter	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	7.836	7.272	7.661	6.922	54.000	56.045
February	7.814	6.623	7.639	6.273	54.000	46.150
March	7.461	.....	7.286	.....	54.000	.....
April	6.890	.....	6.715	.....	54.000	.....
May	7.314	.....	7.114	.....	54.000	.....
June	8.021	.....	7.791	.....	54.000	.....
July	8.688	.....	8.338	.....	54.000	.....
August	8.985	.....	8.635	.....	54.000	.....
September	9.442	.....	9.092	.....	54.000	.....
October	8.801	.....	8.451	.....	54.000	.....
November	8.491	.....	8.141	.....	54.100	.....
December	8.163	.....	7.813	.....	56.050	.....
Year	8.159	.....	7.890	.....	54.180	.....

New York and St. Louis quotations, cents per pound London, pounds sterling per long ton.

Pig Iron Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1918	1919	1918	1919	1918	1919
January	$37.25	$33.60	$33.95	$31.40	$33.95	$32.40
February	37.25	33.60	33.95	31.40	33.95	32.40
March	37.25	.....	33.95	.....	33.95	.....
April	36.15	.....	32.95	.....	33.95	.....
May	36.20	.....	33.00	.....	34.00	.....
June	36.36	.....	33.16	.....	34.16	.....
July	36.60	.....	33.40	.....	34.40	.....
August	36.60	.....	33.40	.....	34.40	.....
September	36.60	.....	33.40	.....	34.40	.....
October	36.60	.....	34.40	.....	35.40	.....
November	36.60	.....	34.40	.....	35.40	.....
December	36.60	.....	34.40	.....	35.40	.....
Year	$36.67	.....	$33.70	.....	$34.45	.....

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.† Mar. 4	
Alaska Gold M.	3⅛
Alaska Juneau	1⅛
Am.Sm.&Ref.,com.	66⅛
Am.Sm. & Ref., pf.	104⅛
Am.Sm.Sec., pf., A	93
Am. Zinc	12⅞
Am. Zinc, pf	43
Anaconda	60⅛
Batopilas Min	1⅛
Bethlehem Steel	63
Butte & Superior	19
Butte Cop. & Zinc	6
Cerro de Pasco	32
Chile Cop	18⅛
Chino	33⅛
Colo. Fuel & Iron	38⅛
Crucible Steel	61⅛
Crucible Steel, pf.	94⅛
Dome Mines	12⅛
Federal M. & S.	10
Federal M. & S., pf.	36⅛
Great Nor., ore ctf.	39⅛
Greene Cananea	41⅛
Gulf States Steel	55⅛
Homestake	97⅛
Inspiration Con.	45
International Nickel	26⅛
Kennecott	30⅛
Lackawanna Steel	67
Mexican Petrol.	176⅛
Miami Copper	22⅛
Nat'l Lead, com.	67⅛
National Lead, pf.	107
Nev. Consol.	16
Ontario Min.	7⅛
Ray Con.	19⅛
Republic I.&S.,com.	77
Republic I.&S., pf.	101⅛
Sloss-Sheffield	48⅛
Tennessee C. & C.	13
U. S. Steel, com	93⅛
U. S. Steel, pf.	114⅛
Utah Copper	69⅛
Va. Iron C. & C.	55

BOSTON CURB* Mar. 4	
Alaska Mines Corp.	‡.12
Boston Ely	.98
Boston & Mont.	.49
Butte & Lon'n Dev.	.11
Calaveras	1
Chief Con	3⅛
Contact	.05
Corbin	‡.25
Cortez	.13
Crown Reserve	48
Crystal Cop.	19
Eagle & Blue Bell	2⅛
First Nat. Cop.	1⅛
Houghton Copper	.30
Intermountain	‡.05
Iron Blossom	.43
Iron Cap	13
Majestic	.18
Mexican Metals	.28
Mines of America	‡.05
Mojave Tungsten	.04
Nat. Zinc & Lead	.08
Nevada-Douglas	.20
New Baltic	1
Oneco	.25
Pacific Mines	‡.35
Rex Cons.	.05
Yukon Gold	.75

SAN FRAN.* Mar. 4	
Alta	.01
Andes	.08
Best & Belcher	.04
Caledonia	.07
Challenge Con.	‡.03
Confidence	.03
Con. Virginia	.17
Gould & Curry	.03
Hale & Norcross	.07
Jacket-Cr. Pt.	.05
Mexican	.15
Occidental	.40
Ophir	.30
Overman	.02
Savage	.07
Sierra Nevada	.06
Union Con.	.20
Utah Con.	.02
Belmont	3.40
Jim Butler	.36
MacNamara	.33
Midway	.32
Mont.-Tonopah	.16
North Star	.08
Rescue Eula	.07
West End Con.	1.15
Atlanta	.05
Booth	.15
Comb. Frac	‡.02
Florence	.15
Jumbo Extension	.12
Kewanas	.05
Nevada Hills	.02
Nevada Packard	.17
Round Mountain	.40
Silver Pick	.06
White Caps	.13

COLO. SPRINGS* Mar. 4	
Cresson Con.	4.87⅛
Doctor Jack Pot	.04
Elkton Con.	.04
El Paso	.14
Gold Sovereign	‡.02
Golden Cycle	1.76⅛
Granite	.14⅛
Isabella	.05⅛
Mary McKinney	.06
Portland	.90
United Gold M.	.12
Vindicator	.43

BOSTON EXCH.† Mar. 4	
Adventure	‡.60
Ahmeek	69⅛
Algomah	‡.30
Allouez	41⅛
Ariz. Com.	11⅛
Arnold	‡.20
Bingham Mines	18⅛
Bonanza	‡.10
Butte-Balakiava	‡.22
Calumet & Ariz.	57⅛
Calumet & Hecla	400
Centennial	‡13⅞
Copper Range	39⅛
Daly West	⅜3
Davis-Daly	4⅛
East Butte	8⅛
Franklin	3
Granby	‡79
Hancock	‡5⅛
Hedley	‡12
Helvetia	‡.20
Indiana	‡.75
Isle Royale	24⅛
Keweenaw	.99
Lake	‡3⅛
La Salle	2⅛
Mason Valley	‡2⅛
Mass	4
Mayflower	3⅛
Michigan	2⅛
Mohawk	52
New Arcadian	1⅛
New Cornelia	15⅛
New Idria	‡8⅛
North Butte	10
North Lake	.60
Ojibway	1⅛
Old Dominion	32
Osceola	48
Quincy	56
St. Mary's M. L.	42⅛
Santa Fe	‡.25
Seneca	14
Shannon	2⅛
Shattuck-Ariz.	‡14⅛
So. Lake	‡1⅛
So. Utah	.14
Superior	5
Superior & Bost.	2⅛
Trinity	2⅛
Tuolumne	.90
U. S. Smelting	47
U. S. Smelting, pf.	48⅛
Utah Apex	2⅛
Utah Con.	8
Utah Metal	1⅛
Victoria	‡1⅛
Winona	‡.90
Wolverine	17

N. Y. CURB† Mar. 4	
Big Ledge	.62⅛
Butte & N. Y.	.50
Butte Detroit	‡.01⅛
Caledonia	.30
Calumet & Jerome	.37⅛
Can. Cop. Corpn.	2
Carlisle	‡2
Cashboy	.06
Con. Ariz. Sm.	1
Con. Coppermines	4⅛
Goldfield Con.	.19
Goldfield Merger	.05⅛
Greenmonster	‡⅞
Hecla Min.	4⅛
Howe Sound	‡3⅛
Jerome Verde	‡.50
Louisiana	‡⅛
Magma	27
Marsh	.03
McKinley-Dar-Sa.	.47
Milford	‡.75
Mother Lode	.32
Nixon Nevada	‡.40
Ohio Cop.	‡⅛
Rawley	‡2⅛
Ray Hercules	2⅛
Richmond	‡.56
Rochester Mines	‡.27
St. Joseph Lead	11
Standard S. L.	37⅛
Stewart	.16
Success	.05
Tonopah	‡3⅛
Tonopah Ex.	2⅛
Tribullion	‡⅛
Troy Arizona	‡.10
United Eastern	‡4⅛
United Verde Ext.	‡30
United Zinc	‡⅛
Utica Mines	‡.08

TORONTO* Mar. 4	
Adanac	.18
Bailey	.04
Beaver Con.	.42
Chambers Ferland	.09
Conlagas	2.00
Hargraves	.02
Kerr Lake	5.12⅛
La Rose	.31⅛
Lake Shore	.90
Min. Corp of Can.	2.00
Nipissing	‡8.75
Peterson Lake	.07
Temiskaming	.30
Wettlaufer-Lor.	.03
Davidson	‡.55
Dome Exten.	.27
Dome Lake	.23
Hollinger	6.12⅛
McIntyre	1.62⅛
Newray	.12⅛
Porcu. Crown	.28
Teck-Hughes	.25
Vipond	.25
West Dome	.14

* Bid prices. † Closing prices. ‡ Last quotations.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	—New York— Current	One Yr. Ago
No. 10	3 90	5.04	6.50	6.50	5.17	5 44½
No. 12	3.95	5.09	6.55	6.55	5.22	5.49½
No. 14	4.00	5.14	6.60	6.60	5.27	5.54½
Black						
Nos. 18 and 20	4.50	5.84	6.02	7.30	6.02	6.24½
Nos. 22 and 24	4.55	5.89	6.07	7.35	6.07	6 29½
No. 26	4.60	5.94	6.12	7.40	6.12	6 40
No. 28	4.70	6.04	6.12	7.50	6.27	6.45
Galvanized:						
No. 10	5.05	6.39	6.57	....	6.57	6 69½
No. 12	5.15	6.39	6.67	7.85	6.62	6.79½
No. 14	5.15	6.39	6.67	8.00	6.67	6.79½
Nos. 18 and 20	5.45	6.59	6.97	8.15	6.97	7.09½
Nos. 22 and 24	5.60	6.44	7.12	8.30	7.12	7.24½
No. 26	5.75	6.74	7.27	8.45	7.27	7.39½
No. 28	6.05	6.19	7.57	8.75	7.57	7.69½

STEEL RAILS—The following quotations are per gross ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	—Pittsburgh— Current	One Year Ago	—Chicago— Current	One Year Ago
Standard bessemer rails	$55.00	$55.00	$65.00	$60–65
Standard openhearth rails	57.00	57.00	67.00	63–65
Light rails, 8 to 10 lb	3.13½	3.13½*	3.13½	3.13½*
Light rails, 12 to 14 lb	3.09	3.09*	3.09	3.09*
Light rails, 25 to 45 lb	3.00	3.00*	3.00	3.00*

TRACK SUPPLIES—The following prices are base per 100 lb. f. o. b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	—Pittsburgh— Current	One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, ⅝-in. and larger	$3.70	$3.90	$4.50	$5.04	$6.15
Track bolts	4.90	4.90	5.50	Premium	7.50
Standard section angle bars	....	3.25	4.45	Premium	5.15

STRUCTURAL MATERIAL—The following are the base prices f. o. b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill, Pittsburgh	—New York— Current	1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in	$2.80	$4.07	$4.19½	$4.14	$4.07	$5.25	$5.50
Channels, 3 to 15 in	2.80	4.07	4.19½	4.14	4.07	5.25	5.50
Angles, 3 to 6 in. ¼ in. thick	2.80	4.07	4.19½	4.14	4.07	5.25	5.50
Tees, 3 in. and larger	2.80	4.12	4.19½	4.14	4.07	5.25	5.50
Plates	3.00	4.27	4.44½	4.14	4.27	5.50	5.70

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$4–5	$4–5	$4–5

RIVETS—The following quotations are per 100 lb.:

	STRUCTURAL Warehouse — Mill Pittsburgh	—New York— Current	One Year Ago	Chicago	St. Louis	San Francisco	Dallas
½-in. and larger	$4.40	$5.67	$7.00	$5.57	$4.74	$6.70	$7.00
CONE HEAD BOILER							
½ in. and larger	4.50	5.77	7.10	5.67	4.84	8.80	7.10
⅝ and ¾	3.65	5.92	7.25	5.82	4.99	6 95	7.25
⅞ and 1	5.00	7.10	7.60	6.17	5.24	7.30	7.60

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	+17½%
Galvanized cast steel rigging	2½%
Bright plow steel	30%
Bright cast steel	17½%
Bright iron and iron tiller	List

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	$6.25	$7.25	$7.00@7.25	$6.25	$8.00	$7.25
Assorted	6.40	7.75	7.15@7.40	6.40	8.25	7.50

BAR IRON AND STEEL—Per pound to large buyers at mill, Pittsburgh

Iron bars..... 3.5c. Steel bars..... 2.90c.

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
$0.12	$0.16½	$0.18	$0.19	$0.18½	0.16½

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	16c.	14c.	15c.	16c.
Hollow	24c.	25c.	...	28c.

STEEL AND IRON PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing card of Jan. 1 for steel pipe and iron pipe:

Inches	Steel Black Per Cent.	Galvanized Per Cent.	Inches	Iron Black Per Cent.	Galvanized Per Cent.
BUTT WELD					
⅜ to 3	54	40½	¼ to 1½	36	20
LAP WELD					
2	47	34½	1¼	21	6
2½ to 6	50	37½	1½	28	14
7 to 12	47	33½	2	29	15
13 and 14	37½	..	2½ to 6	31	18
15	35	..	7 to 12	28	15
BUTT WELD, EXTRA STRONG PLAIN ENDS					
⅜ to 1½	52	39½	¼ to 1½	36	21
2 to 3	53	40½			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	45	33½	1¼	22	7
2½ to 4	48	36½	1½	28	14
4½ to 6	47	35½	2	30	17
7 to 8	43	29½	2½ to 4	32	20
9 to 12	38	24½	4½ to 6	31	19
			7 to 8	23	11
			9 to 12	18	6

From warehouses at the places named the following discounts hold for steel pipe:

	Black — New York	Cleveland	Chicago
⅜ to 3 in. butt welded	43%	43%	44.9%
3½ to 6 in. lap welded	38%	39%	40.9%
	Galvanized — New York	Cleveland	Chicago
⅜ to 3 in. butt welded	27%	26%	29.9%
3½ to 6 in. lap welded	23%	23%	26.9%

Malleable fittings, Class B and C, from New York stock sell at list plus 15%. Cast iron, standard sizes, 5%.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	—New York— Current	One Year Ago	—Cleveland— Current	One Year Ago	—Chicago— Current	One Year Ago
Hot pressed square	$0.80	$1.00	$1.25	$1.40	$0.98	$1.05
Hot pressed hexagon	.80	1.00	1.05	1.20	.78	.85
Cold punched square	2.50*	1.00	.75	.75	1.00	1.50
Cold punched hexagon	2.50*	1.00	.75	.75	1.00	1.50

* List plus.

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	50–10%	40%
Chicago	50%	60%
Cleveland	50–10%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
⅜ by 4 in. and smaller	40–10%	40–10%	40%
Larger and longer up to 1 in. by 30 in.	20–5%	20–5%	25—5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York..... $2.00 Cleveland..... $1.50 Chicago..... $1.75
For cast-iron washers the base price per 100 lb. is as follows:
New York..... $6.00 Cleveland..... $4.25 Chicago..... $4.50

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots N. Y.	Carload Lots Chicago	Less Than Carload Lots N. Y.	Less Than Carload Lots Chicago
Tar felt (14 lb. per square of 100 sq.ft.)	$54.00	$52.00	$55.00	$53.00
Tar pitch (in 400-lb. bbl.)	21.00	18.00	22.00	19.00
Asphalt pitch (in barrels)	36.00	36.00	41.50	41.50
Asphalt felt	67.50	67.50	72.00	72.00

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.l.
No. 1 grade	$1.35	$1.60	$1.70	$1.95	$2.05	$2.30
No. 2 grade	1.20	1.45	1.50	1.75	1.80	2.05

Asbestos asphalt-saturated felt (14 lb. per square) costs $5.00 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $2.10 per roll in carload lots and $2.35 for smaller quantities.

Shingles, red and green slate finish, cost $5.50 per square in carloads, $5.75 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
St. Paul	$.056	$0.11	$0.162
Cincinnati	.086	.165	.218
Seattle	.09	.175	.30
Los Angeles*	.079	.144	.181
New Orleans	.16	.22	.32

* F.o.b. factory, 4, 8 and 10 inch.

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20 Ft. and Under			12 x 12-In. 20 Ft. and Under	
	Y. P.	Fir	Hemlock	Spruce	Y.P.	Fir
Cincinnati	$37.00	.....	$36.00	.....	$41.00	$40.00
Kansas City	40.50	41.50	$41.50	$39.50	45.50	43.50
Seattle	17.50	17.50	17.50	17.50	17.50	17.50
New Orleans	48.00	.....	.....	.....	50.00	.....
St. Paul	.....	50.00	46.00	46.00	.....	53.00
Denver	44.00	34.50	34.50	.....	49.00	39.00
Los Angeles	*	*	*	*	*	*

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and G. 10 In. x 16 Ft.	
	Y.P.	Fir	Hemlock	Y.P.	Fir
Cincinnati	$43.00	.....	$39.00	$42.00	$39.00
Kansas City	50.00	$55.75	55.75	53.50	60.00
Seattle	17.50	17.50	17.50	17.50	17.50
New Orleans	54.00	.....	.....	60.00	.....
St. Paul	50.50	40.00	.....	.....	44.50
Denver	45.00	33.50	33.50	38.00	31.00
Los Angeles	39.00	33.00	34.00	*	*

* Los Angeles: Base price of fir is $32; of hemlock, $34; redwood, $35.

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Dallas	Chicago	San Francisco
Wire	$3.50	$4.37	$4.75	$4.32	$5 35
Cut	4.00	6.50	....	6.50	6.75

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	Current	One Month Ago	One Year Ago
New York	$3.45	$3.45	$2.25
Jersey City	3.62	3.62	2.16
Boston	3.57	3.67	2.37
Chicago	3.05	3.05	2.21
Pittsburgh	3.15	3.15	2.31
Cleveland	3.32	3.32	2.44
Denver	3.67	3.67	3.20

Note—Bag refund is generally 25c. each; exceptions being, Cincinnati, 9c.; Dallas, 10c.; San Francisco, 15c.

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$17.50	$14.50	$2.90	$2.65
Chicago	18.00	17.50	1.80*	1.10*
St. Louis	22.00	18.00	.....	1.75*
Boston	22.20	18.00	3.75	3.40
Dallas	2.25*	1.25*	.....	.....
San Francisco	19.00	16.00	.....	2.00†
St. Paul	25.00	19.00	1.97*	1.93*
New Orleans	19.74	16.45	1.97*	1.93*
Cincinnati	14.20	11.95	.....	.....
Denver	.....	26.25‡	.....	2.50*
Los Angeles	.....	.....	3.00	2.30†

* 200-lb. barrels. † Per 180-lb. bbl. ‡ Per ton.

Note—Refund of 10c. per barrel.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw per barrel	$1.50	$1.39	$1.65	$1.40	$1.66	$1 41
5-gal. cans	1.65	1.49	1.80	1.50	1.88	1.51

WHITE AND RED LEADS in 500-lb. lots sell as follows in cents per pound:

	Red				White			
	Current		1 Year Ago		Current		1 Yr. Ago	
	Dry	In Oil	Dry	In Oil	Dry and In Oil		Dry and In Oil	
100-lb. keg	13.00	14.50	11.25	11.50	13.00		12.50	
25- and 50-lb. kegs	13.25	14.75	11.50	11.75	13.25		12.75	
12½-lb. keg	13.50	15.00	11.75	12.00	13.50		13.00	
5-lb. cans	15.00	16.50	13.25	13.00	15.00		14.50	
1-lb. cans	16.00	17.50	13.25	13.50	16.00		14.50	

MINING AND MILLING SUPPLIES

HOSE—

Fire	50-Ft. Lengths
Underwriters' 2½-in.	75c. per ft.
Common, 2½-in.	30%

Air	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0.55	$0.40	$0.30

Steam—Discounts from List

First grade..... 25% Second grade.....35% Third grade.....40%

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	40–5%	35%
St. Louis	45%	50%
Chicago	45%	40+5%
Birmingham	30%	35%
Denver	35–5%	30%
Cincinnati	40—10%	40%

RAWHIDE LACING—50c. for cut; 45c. per sq.ft. for ordinary.

MANILA ROPE—For rope smaller than ¼-in. the price is ¼ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ¼-in., 8 ft., ⅜-in., 6; ½-in., 4½; ⅝-in., 3½; ¾-in., 2 ft. 10 in.; 1-in., 2 ft. 4 in. Following is price per pound for ¼-in. and larger, in 1200-ft. coils:

Boston	$0.32	Denver	$0.32
New York	.30½	Kansas City	.32½
Cincinnati	.33	New Orleans	.31½
Chicago	.30½	Seattle	.24
St. Paul	.32	St. Louis	.21½
San Francisco	.29	Atlanta	.24

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0 95
Asbestos for high-pressure steam	1.60
Duck and rubber for piston packing	1.00
Flax, regular	1.20
Flax, waterproofed	1.60
Compressed asbestos sheet	1.00
Wire insertion asbestos sheet	1.20
Rubber sheet	.60
Rubber sheet, wire insertion	.80
Rubber sheet, duck insertion	.50
Rubber sheet, cloth insertion	.30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.20
Asbestos wick, ½- and 1-lb. balls	.85

REFRACTORIES—Following prices are f. o. b. works, Pittsburgh:

Chrome brick	net ton	$120.00 at Chester, Penn.
Chrome cement	net ton	65.00 at Chester, Penn.
Clay brick, 1st quality fireclay	net ton	40–30 at Clearfield, Penn.
Clay brick, 2nd quality	net ton	38–48 at Clearfield, Penn.
Magnesite, dead burned	net ton	37.50 at Chewalah, Penn.
Magnesite brick, 9 x 4½ x 2½ in.	net ton	90.00 at Chester, Penn.
Silica brick	net ton	45–55 at Mt. Union, Penn.

Standard size fire brick, 9 x 4½ x 2½ in. The second quality is $4 to $5 cheaper per 1000.

St. Louis—Fire Clay, $35 to $50.

Birmingham—Fire clay, $40–$45; silica, $40–$50; magnesite, $90; chrome, $120.

Chicago—Second quality, $25 per ton.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

	Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago	Plain	1.48	1.33
San Francisco	Douglas Fir—Green	1.35	.96
San Francisco	Douglas Fir—Creosoted	2.70	1.92

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98		
7x9x8 white oak			1.05
7x9x8 red oak, No. 4	.80	No. 5	.87

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

	New York	Chicago In Bbl. Carloads		Denver In Bbl. Lots
Pure steam-distilled pine oil, sp. gr. 0.925-0.94	$0.58	$0.71	$0.69	$0.81
Pure destructively distilled pine oil	.58	.68†	.66†	.55–.65
Pine tar oil, sp. gr. 1.02 = 1.035	.35	.36	.34	.60
Crude turpentine	.45	.68	.66	.60–.65
*Hardwood creosote, sp. gr. 0.96-0.99	.23	...	...	.42–.45

* F.o.b. Cadillac, Mich. † Very scarce.

COTTON WASTE—The following prices are in cents per pound:

	New York Current	New York One Year Ago	Cleveland	Chicago
White	11.00 to 13.00	13.00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	10.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½ x 13½	13½ x 20½
Cleveland	$52.00	$58.00
Chicago	48.00	50.00

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York	.....	$0.29½	$0.34½	.....	$2.40
Boston	$0.22½	.26½	.31½	$0.35½	2.40
Cincinnati	.18½	.22½	.26½	.....	2.35
Kansas City	.20½	.25½	.30½	.38½	2.45
New Orleans	.20½	.26½	.31½	.37½	2.60
Seattle	.14½	.20½	.25½	.31½	1.90
Chicago	.18½	.22½	.30	.36	2.35
St. Paul	.19	.24½	.30½	.....	2.45
St. Louis	.19	.25½	.30½	.36½	.....
Denver	.17½	.24	.29	.35	2.45
Dallas	.25	.31	.36	.42	.....

CHEMICALS

SODIUM CYANIDE—New York price is 30c. per lb.; Denver, 42c.; Chicago, 31½c.; St. Louis, 31c.

SODIUM SULPHIDE—In New York the price per pound is 4½c. for concentrated, 2½c. for crystals. The St. Louis price is 6c. for concentrated, 5½c. for fused; 3½c. for crystals. The Chicago price is 6c. for concentrated, 3½c. for crystals. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 14c. per lb.; Chicago, 13c.; Denver, 13½c. f.o.b. Pueblo; St. Louis, 12½c., less than car lots 13c.

ALUMINUM DUST—Chicago price is $1.30 per lb.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points.

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union 25-Lb. Drum Per Drum
East of the Mississippi, North of Chattanooga	$106.00	$101.00	$1.52
Southeastern portion U. S. A.	115.50	110.50	1.63
Texas (except El Paso)	124.00	119.00	1.74
El Paso, Texas	126.00	121.00	1.77
Denver, Colo.	124.00	119.00	1.74
West Coast	129.00	124.00	1.81